INSTRUCTION MANUAL
SERIES X-1
DIGITAL VOLTMETER

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

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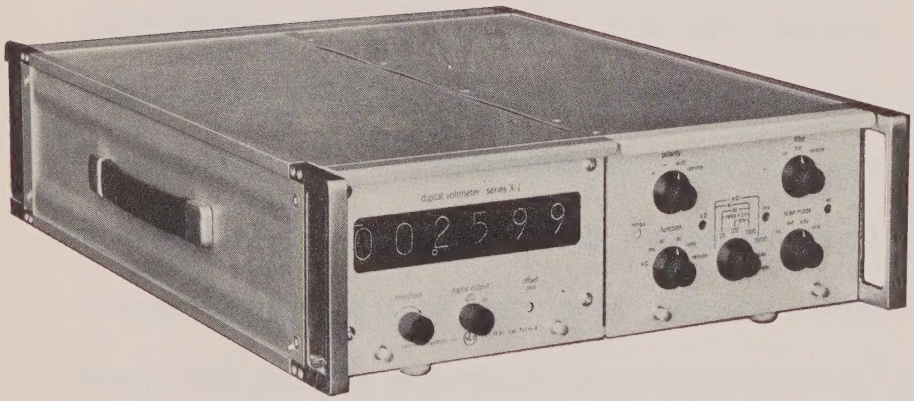

This Manual Applies to Series X-1 Digital Voltmeters Bearing
Part No. 36-646, 36-758, 36-759, 36-771, 36-786 or 36-784.

Originator of the Digital Voltmeter
non-linear systems, inc.
DEL MAR, CALIFORNIA

Printed in the United States of America

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CAUTION

THE SERIES X-1 DIGITAL VOLTMETER IS A PRECISION INSTRUMENT. DO NOT HANDLE THE 5TH DECADE PLUG-IN ASSEMBLY, P/N 36-16, UNLESS CLEAN RUBBER GLOVES ARE WORN. FINGERPRINTS, DIRT OR ANY FOREIGN MATTER ON COMPONENTS, CONNECTIONS OR PRINTED CIRCUIT BOARDS MAY CAUSE LEAKAGE PATHS WHICH CAN REDUCE ACCURACY OF THE INSTRUMENT.

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CHAPTER I

INTRODUCTION AND SPECIFICATIONS

The NLS Series X-1 Digital Voltmeter is a three-range, five-digit instrument with automatic range and polarity functions. Provisions for 20% over-ranging are incorporated. Its circuitry is all solid state and its principle of analog-to-digital conversion is all-electronic successive approximation scan logic. The instrument may be used as a bench model or may be rack-mounted.

SCOPE OF MANUAL

This manual specifically applies to six models of the Series X-1 Digital Voltmeter as described in the preceding paragraph. Four models have digital output and remote control capabilities (see Table I) and the others do not. The power switch is located on the rear of instruments bearing P/N's 36-646, 36-771 and 36-874 and on the front of instruments bearing P/N's 36-758, 36-759 and 36-786. Table I also lists the drawer assemblies and major subassemblies (with quantities) of each model. In addition to the basic DC voltage measurement, these six models of the Series X-1 are capable (at customer's option) of measuring ratio, AC voltage, millivolts and ohms. For ratio measurement, Reference Supply Assembly (P/N 36-11) is replaced by Ratio Reference Assembly (P/N 36-195). For AC measurement, either a 10K Hz or a 100K Hz AC converter is inserted into J12 of the Function Unit Assembly (right hand drawer). For MV measurement, a Preamplifier Assembly is inserted into J14 of the Function Unit Assembly. For KΩ measurement, an Ohms Converter Assembly is inserted into J13 of the Function Unit Assembly. Function Relay Assembly (P/N 36-651) is required if any of the above options are utilized in the instrument. Two active filters (high speed and low speed) are also offered as optional accessories to be substituted for standard Filter Assembly 36-296. Refer to specifications under FILTERS. Schematic and wiring diagrams for each model and accessory will be found at the end of the manual.

ACCURATE AND STABLE

The Series X-1 operates as an automated version of the laboratory potentiometer, the most accurate voltage measuring device. That is, it generates a feedback voltage equal to the unknown input voltage in discrete steps, by operating a precision voltage divider, energized by a highly regulated power supply.

High-speed, reliable transistor switches operate the Series X-1's voltage divider which is composed of precision resistors. The switches are so stable that adjustment potentiometers are not required to compensate for switch drift. Voltage for the divider is controlled by two Zener diodes which have been carefully selected to ensure that their combination results in a temperature coefficient sufficiently low to provide an ultrastable supply. A temperature stabilizing oven is not required.

EASY TO SERVICE

The operational assemblies of the instrument are housed in three separate, easily removed, plug-in drawers and virtually all components within these drawers are mounted on plug-in

Table I. Series X-1 Model Variations by Assemblies

	REMOTE CONTROL AND PRINTOUT					WITHOUT REMOTE CONTROL AND PRINTOUT		
	(BCC) 36-646	(BCC) 36-758	(6-LINE) 36-759	(BVL) 36-874	QTY 1	36-771	36-786	QTY 1
Buffer Assembly	36-555	36-555	36-555	36-555	1	36-555	36-555	1
Comparator Assembly	36-26	36-26	36-26	36-26	1	36-26	36-26	1
Decade (1-4) Assembly	36-14	36-14	36-14	36-14	4	36-14	36-14	4
Decade (5) Assembly	36-16	36-16	36-16	36-16	1	36-16	36-16	1
Decade Counter Assembly	36-8	36-8	36-8	36-8	2	36-8	36-8	2
Decode Assembly	36-67	36-67	36-67	36-67	5	36-67	36-67	5
Filter Assembly	36-296	36-296	36-296	36-296	1	36-296	36-296	1
Function Unit Assembly	36-655	36-655	36-706	36-655	1	36-655	36-655	1
Inverter Assembly	36-43	36-43	36-43	36-43	1	36-43	36-43	1
Jumper Assembly	36-746	36-746	36-746	36-746	1	36-746	36-746	1
Polarity Flip-Flop Assembly	36-269	36-269	36-269	36-269	1	36-269	36-269	1
Power Supply Unit Assembly	36-470	36-473	36-473	36-470	1	36-474	36-397	1
Program Counter Assembly*	36-249	36-249	36-249	36-249	2	36-249	36-249	1
Range Counter Assembly	36-272	36-272	36-272	36-272	1	36-272	36-272	1
Range Decision Assembly	36-324	36-324	36-324	36-324	1	36-324	36-324	1
Range Limit Logic Assembly	36-654	36-654	36-654	36-654	1	36-654	36-654	1
Readout Unit Assembly	36-469	36-469	36-469	36-469	1	36-469	36-469	1
Rectifier Assembly	36-495	------	------	36-495	1	36-495	------	1
Rectifier & Power Relay Assembly	------	36-485	36-485	------	1	------	36-485	1
Reference Assembly	36-11	36-11	36-11	36-11	1	36-11	36-11	1
Regulator Assembly	36-266	36-266	36-266	36-266	1	36-266	36-266	1
Scan Control Assembly*	------	------	------	------	0	36-494	36-494	1
Scan Counter Assembly	36-275	36-275	36-275*	36-275	1	------	------	0
Threshold & Clock Assembly	36-73	36-73	36-73	36-73	1	36-73	36-73	1
Transfer Board No. 1 Assembly	36-179	36-179	36-563	36-409	1	------	------	0
Transfer Board No. 2 Assembly	36-488	36-488	36-564	36-413	1	------	------	0
Transfer Board No. 3 Assembly	36-185	36-185	36-836	36-185	1	------	------	0

On DVM P/N's 36-771 & 36-786

1. Scan Control Assembly, 36-494, is substituted for Scan Counter Assembly, 36-275 (Connector J3 of Function Unit Assembly).
2. Program Counter Assembly, 36-249, is inserted into Connector J5 of Function Unit Assembly. Connector J4 (although wired for use) is without a board assembly.

circuit boards for easiest access and replacement. It is thus possible to keep the instrument operative with a minimum of down-time. For example, logic and feedback voltage generator circuits common to any one decade (readout window) are mounted on a separate board and four of the five decade boards (decades 1 thru 4) are completely interchangeable within the instrument. The five decode boards are also completely interchangeable. Should any of the first four decade boards or any of the decode boards fail, it can be omitted from the right-most (1st decade) and the Series X-1 will still operate, but as a 4-digit instrument (e.g., if the input were 4.7391, the readout would display 4.739). This maintenance philosophy enjoys wide acceptance among instrument users who require that both trained and untrained personnel be able to service the instruments.

MEASURING SPEED

The speed of the Series X-1 instrument, depending upon range and polarity changes required, will vary from 16 to 106 milliseconds per reading. Range changes occur when the previous measurement is not within the proper range for the new measurement; that is, the range changes only when required. Unlike many other instruments, the Series X-1 does not revert to the lowest range between readings.

"Range Memory" increases over-all measuring speed by preventing needless ranging. It does this by remembering the range last used and using it for the next measurement if suitable (i.e., if the next voltage is neither above full scale of the range last used, nor lower than 1/10 of it).

The Series X-1 utilizes fixed sequence logic. With this logic, the instrument creates a feedback voltage equal to the input, and feedback voltage changes are made decade by decade in one programmed scan, starting with the left-most decade (left-most readout window) and progressing to the right. Even if the input voltage varies during measurement, the instrument's reading represents a valid voltage value that existed during the measuring cycle. In contrast, instruments having digital servo logic (tracking logic) will "hunt" continuously as long as the input varies by more than one digit. Hunting can only be stopped by decreasing DVM comparison amplifier gain, which must be done manually since the gain should be reduced only enough to prevent hunting.

COMMON-MODE-REJECTION

Rejection of common-mode signals, those caused by AC or DC currents flowing between signal source ground and instrument chassis ground, is a key feature of the Series X-1 DVM. Common-mode signal rejection (CMR) is important in a wide range of applications - testing complex electrical and electronic systems, in automatic measuring systems, and measuring outputs from thermocouples, strain gages and other transducers where common-mode signals may be many times greater than the measured DC voltage.

FLOATING INPUT

Because input signal leads are not connected to the Series X-1's outer chassis, signal-to-chassis potentials up to 500 volts are permissible. Floating input adds to the DVM's versatility by permitting it to measure voltage sources which could not be accurately measured by a non-isolated meter.

The NLS Sales Representatives or Engineering Department will be pleased to assist you with specific application problems and, of course, will gladly welcome your comments and suggestions. A contact with the nearest NLS office or to the main office in Del Mar, California will bring prompt response.

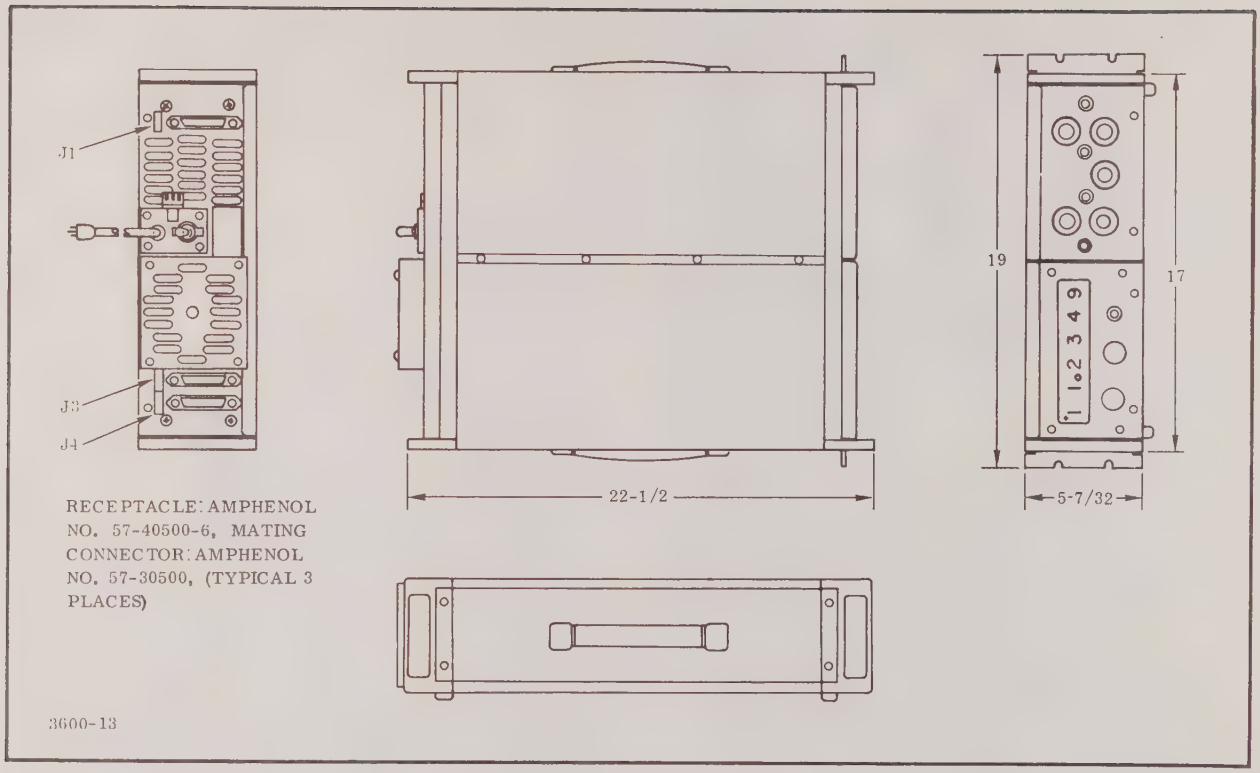


Figure 1-1. Dimension Diagram

SPECIFICATIONS, BASIC DVM

CIRCUITRY:	All solid state.
PRINCIPLE OF ANALOG-TO-DIGITAL CONVERSION:	All-electronic successive approximation scan logic.
COMMON-MODE REJECTION:	120 DB, VDC - 60 Hz.
FULL SCALE DC RANGES:	±9.9999, ±99.999, ±999.99 with 20% over-range on the two lower ranges.
ACCURACY UNDER ASA REFERENCE CONDITIONS:	0.001% of full scale +0.005% of reading.
RESOLUTION:	One digit
RESPONSE TIMES:	Input Buffer Response Time - 10 MS.
	Digitizing Time - 6 MS.

RESPONSE TIMES (CONT):	Time Required for Transfer Relays to Operate - 7 MS.
	Time to Select a Fixed Range Remotely (Operate Time of Range Transfer Relay + Operate Time of Range Selection Relay) - 10 MS.
	Time Required for Each Automatic Range Change - 30 MS.
	Time Required for Each Automatic Polarity Change - 30 MS.
INPUT RESISTANCE:	10V Range - 10,000 megohms.
	100V Range and 1,000 Range - 10 megohms.
	Input resistance is constant except when input is overloaded.
FILTERS:	Manual and Remote Switching
Standard	37 DB minimum at 60 Hz Settling time - 2 seconds to 0.01% with up to 100K source resistance.
Options	
Active (high speed)	36.5 DB minimum at 60 Hz Settling time - 170 MS to 0.01% with 10K source resistance
Active (low speed)	76 DB minimum at 60 Hz Settling time - 750 MS to 0.01% with 10K source resistance
METHODS OF CONTROL:	Range Selection - Automatic, manual and remote.
	Polarity Selection - Automatic, manual and remote.
	Start Command - Internal, external and manual.
	Function Selection - Manual and remote.
OUTPUT CONNECTIONS:	Output Data - BCD contact closures for isolated output. BCD voltage levels if isolation is not required.
	Digital Output Command - Contact closure for isolation. Voltage level if isolation is not required.
SIGNAL INPUT CONNECTIONS:	Signal inputs are on rear panel only. They consist of Sense Hi, Sense Lo, Guard, Current +, Current -, and Ref. In. These inputs may be floated ±500 VDC with respect to chassis ground (earth).

AMBIENT TEMPERATURE:	12^{o}C to 40^{o}C.
POWER REQUIREMENTS:	115 VAC, 50 - 60 CPS.
MOUNTING POSITION:	Due to the mercury-wetted relay, utilized for polarity switching, the mounting position must be restricted to within 30^{o} of horizontal.
WEIGHT:	Approximately 50 pounds.

RATIO SPECIFICATIONS

RANGES:	±1.19999/±11.9999/±99.999 -10V Reference ±5%
ACCURACY UNDER ASA RATED CONDITIONS:	0.001% FS + 0.002% reading (short term)

PREAMPLIFIER SPECIFICATIONS

RANGES:	119.999, 1199.99 MVDC
ACCURACY UNDER ASA REFERENCE CONDITION:	±(0.01% of reading +0.01% of full scale)
STABILITY:	Short Term: ±(0.01% of full scale) Long Term: See rated accuracy
RESPONSE TIME:	Step to 0.01% of final value: 1 second* Each range change to 0.01% of final value: 1 second*
INPUT CHARACTERISTICS:	Resistance, Steady State: 100 MΩ, minimum Resistance, Dynamic: 20 KΩ, minimum

AC/DC CONVERTER SPECIFICATIONS

RANGES:	Type I - Frequency: 50 Hz to 10K Hz Type II - Frequency: 50 Hz to 100K Hz Type I - Amplitude: 1.19999, 11.9999, 119.999, 500.00 VAC Type II - Amplitude: 1.19999, 11.9999, 119.999, 500.00 VAC @ 10K Hz decreasing to 150 VAC @ 100K Hz

*Response time is considerably increased for signals whose source resistance is higher than 10 KΩ.

ACCURACY UNDER ASA REFERENCE CONDITION:	Type I - ±(0.1% of reading +0.05% of full scale) Type II - ±(.1% of reading +.05% of full scale) 50 Hz to 10K Hz ±(.3% of reading +.1% of full scale) 10K Hz to 30K Hz ±(.5% of reading +.1% of full scale) 30K Hz to 100K Hz
STABILITY:	Short Term: ±0.02% of full scale Long Term: See rated accuracy
RESPONSE TIME:	Step to 0.1% of final value: 600 milliseconds Range to 0.1% of final value: 630 milliseconds
INPUT CHARACTERISTICS:	Resistance: 1 meg ±1% (all ranges) Capacitance: 100 PF maximum (all ranges)

KΩ-DC CONVERTER SPECIFICATIONS

RANGES:	1.19999, 11.9999, 119.999, 1199.99, 11999.9 KΩ
ACCURACY UNDER ASA REFERENCE CONDITIONS:	±(0.01% of reading +0.001% of full scale), lowest three ranges ±(0.03% of reading +0.001% of full scale), 1,000 KΩ range ±(0.1% of reading +0.001% of full scale), 10,000 KΩ range
STABILITY:	Short Term: ±(0.005% of full scale), lowest three ranges Long Term: See rated accuracy
RESPONSE TIME:	Step to 0.01% of Final Value, 4 Lowest Ranges: 100 MS 0.1% of Final Value, Highest Range: 0.7 SEC Each Range Change to 0.01% of Final Value: 630 milliseconds* (Highest range settles to 0.2% in 630 milliseconds)
TEST VOLTAGES AND CURRENTS:	Voltage across unknown: 16 VDC all ranges Current through unknown: 1K 10 MA 10K 1 MA 100K 100μA 1,000K 10μA 10,000K 1μA

*If highest range is not needed, speed can be markedly improved.

CHAPTER II

INSTALLATION AND OPERATION

UNPACKING

The instrument is shipped in a heavy cardboard container. Cut the tape on the top of the container and open. If damage is seen, promptly notify the carrier.

MOUNTING

The unit may be mounted in a standard 19-inch mounting rack (mounting brackets for this utilization are provided) or may be used as a bench instrument. Due to the mercury-wetted relay utilized for polarity switching, the mounting position must be restricted to within 30° of horizontal.

CAUTION

Do not operate the instrument before removing the drawer assemblies and ensuring that each plug-in board is firmly in place. See Calibration with Drawers Removed, Initial Preparation, DC Voltage Calibration in Chapter III for instructions on drawer removal.

POWER SOURCE

The instrument requires a 115-volt, 50-60 cycle, single-phase power source for operation.

FUSING

The instrument is protected by a 3AG one-ampere slo-blo fuse which is located in an extractor post on the rear of the power supply unit.

POWER GROUNDING

The third pin of the power plug grounds the outer chassis of the instrument (Figure 2-1). The three internal drawers have no connection to chassis ground.

CABLE CONNECTIONS

The instrument is supplied with an input cable for connection to input connector J1 (see Figure 2-2, cable drawing 15004-525 and applicable calibration instructions for connection information). Mating connectors are supplied for remote control connector J3 and digital output connector J4 (see drawing

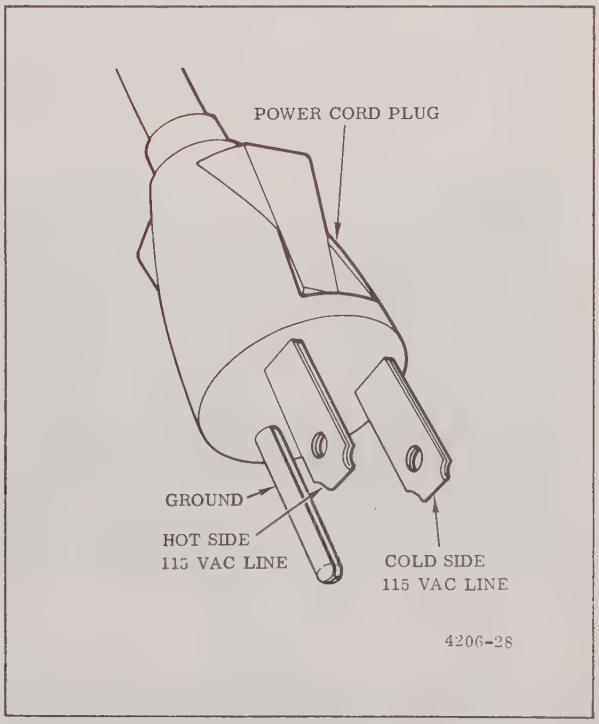


Figure 2-1. Power Plug Pin Coding

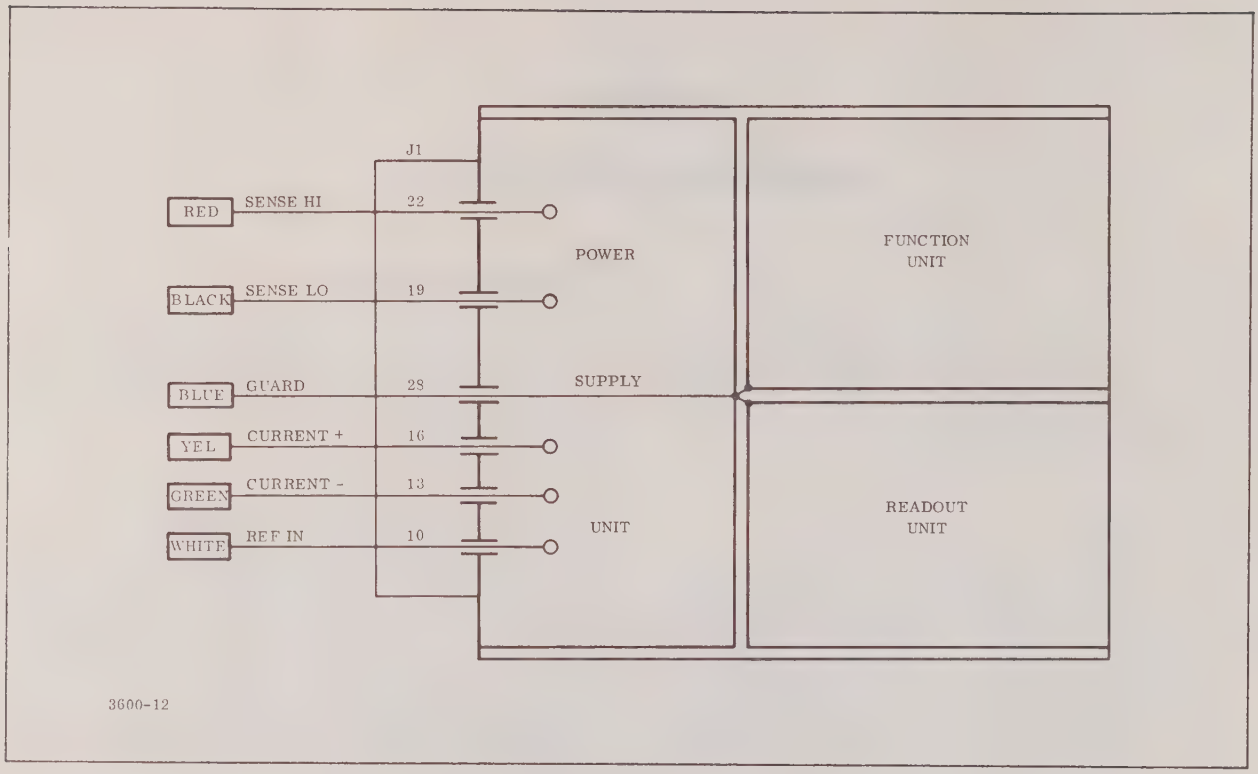


Figure 2-2. Input Connections

number 36-646, sheet 4, 36-758, sheet 4, 36-759, sheet 4, or 36-874, sheet 4, for connection information). See Figure 2-3 for location of all connectors.

CONTROLS

READOUT UNIT

Threshold Control

Associated with any number stored in the decade flip-flops (and displayed in the readout), is a dead band from which the input signal must emerge (in the positive or negative direction) before a new measurement will result in a new reading.

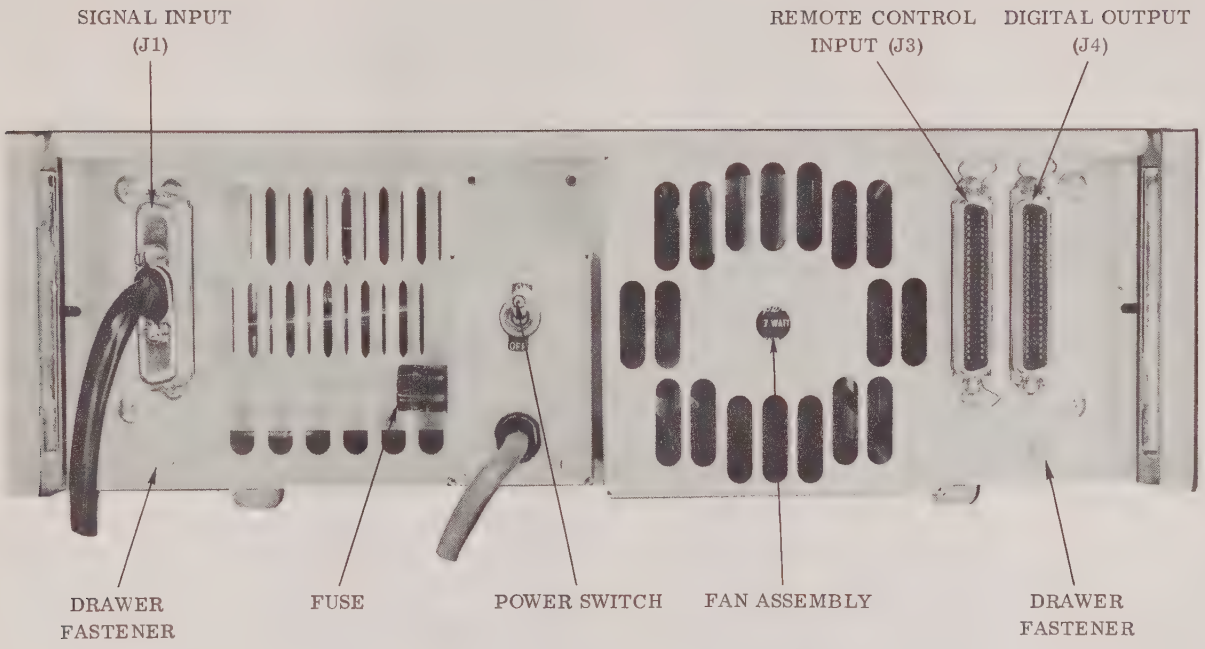
The THRESHOLD control is used to set the width of the dead band. With the control in the extreme counterclockwise position, the dead band width is essentially zero. With the control in the extreme clockwise position, the dead band width is approximately 10 digits, in the least significant decade.

Measurement of inputs outside the dead band are made at full accuracy, the effect of the THRESHOLD control being automatically cancelled out.

The THRESHOLD control can be used to reduce bobble in the readout display.

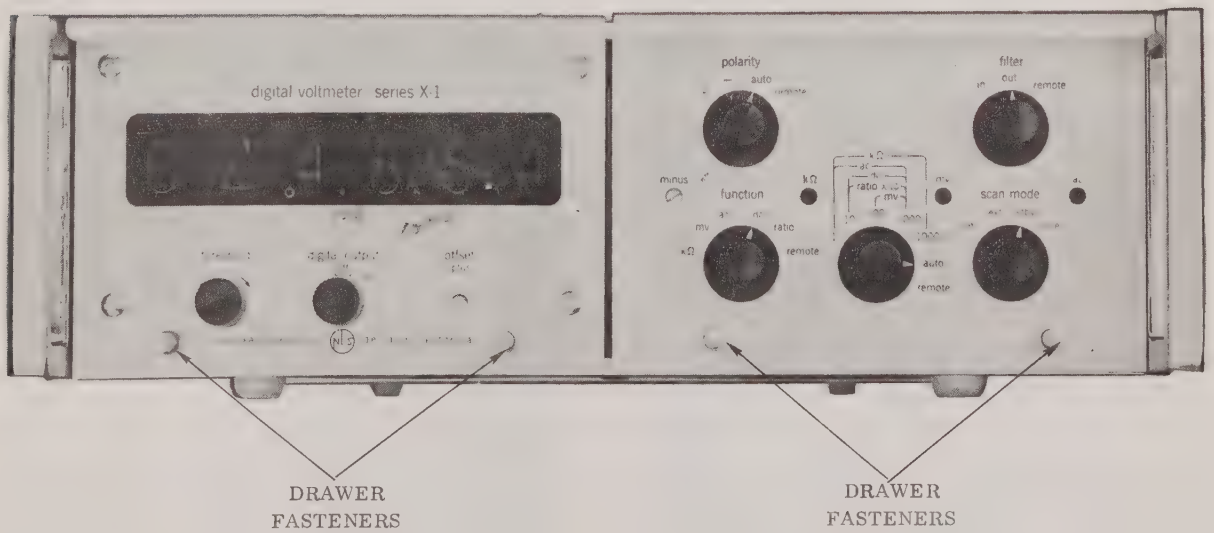
Digital Output Switch

The DIGITAL OUTPUT control (DVM P/N's 36-646, 36-771 and 36-874) is a three position switch in series with the common line which, when the switch is ON, feeds the coils of the data transfer relays and the print



3600-101

Figure 2-3. Rear View



3600-102

Figure 2-4. Front View

command relay. Whenever the instrument is not being used with a recording device, it is recommended that the DIGITAL OUTPUT switch be placed in the OFF position to prolong the life of the transfer relays. The ON position of this switch is wholly ineffective on the Series X-1 model without remote control and printout capabilities (P/N 36-771). For digital output control of the Model X-1 bearing part number 36-758 or 36-759, refer to the following paragraph.

POWER SWITCH (DVM P/N's 36-758, 36-759, and 36-786)

The POWER switch is a three-position switch labeled OFF, ON and RECORD. When the switch is in the OFF position, the power relay located on the Rectifier and Power Relay Assembly (P/N 36-485) is de-energized. When in the ON position, the instrument is ready to provide readings. For maximum specified accuracy, a warm-up period of 30 minutes is recommended. When in the RECORD position, the switch feeds the coils of the data transfer relays and the print command relay. Whenever the instrument is not being used with a recording device, it is recommended that the POWER switch be placed in the ON position to prolong the life of the transfer relays. The RECORD position of this switch is wholly ineffective on the Series X-1 model without remote control and printout capabilities.

Offset Plus Control

The OFFSET PLUS control is a screwdriver-adjust potentiometer which, when in the plus polarity only, can offset the meter reading up to approximately ten digits (except when the reading is near all zeros). Its use is described in Section III, Calibration Instructions under Zero Offset Adjustments.

FUNCTION UNIT

Polarity Switch

The POLARITY switch is a four position switch providing for the manual selection of either plus (+) or minus (-) polarity readings or, as when in the AUTO position, allowing the instrument to automatically select the proper polarity. When the switch is placed in the REMOTE position, polarity selection may be made by an external triggering device.

Filter Switch

The FILTER switch has three positions. When in the OUT position, the filter is disconnected. When in the IN position, the filter is connected and the reading time of the instrument is automatically increased to allow for filter response time. When the switch is placed in the REMOTE position, filter selection may be made by an external triggering device.

Range Switch

The RANGE switch has seven positions. When in the 1 position, the instrument is locked in the 1-volt range for the measurement of AC voltages or in the 1KΩ range for the measurement of ohms. When in the 10 position, the instrument is locked in the 10-volt range for the measurement of AC, DC and ratio voltages or in the 10KΩ range for the measurement of ohms. When in the 100 position, the instrument is locked in the 100-volt range for the measurement of AC, DC and ratio voltages, in the 100 MV range for the measurement of millivolts or in the 100KΩ range for the measurement of ohms. When in the 1000 position, the instrument is locked in the 1000-volt range for the measurement of AC, DC and ratio voltages, in the 1000 MV range for the measurement of millivolts or in the

1 MEG range for the measurement of ohms. When in the 10000 position, the instrument is locked in the 10 MEG range for the measurement of ohms. When in the AUTO position, the instrument automatically selects the proper range. When in the REMOTE position, range selection may be made by an external triggering device.

Offset Minus Control

The OFFSET MINUS control is a screwdriver-adjust potentiometer which, in the minus polarity only, can offset the meter reading by up to approximately ten digits (except when the reading is near all zeros). Its use is described in Section III, Calibration Instructions under Zero Offset Adjustments.

Scan Mode Switch

The SCAN MODE switch has four positions. When in the INT. position, the readings are initiated internally. When in the EXT. position, the readings are initiated externally by de-energizing the trigger hold-off relay (see drawing number 36-646, sheet 4). If only a single reading is desired, the trigger holdoff relay should be de-energized and then energized within a period of seven milliseconds. When in the STBY. position, the power is on but the instrument cannot be triggered either internally or externally and the last measurement remains stored. The ONE position is spring loaded. Moving the switch to this position causes the instrument to make a single measurement. If a recording device is in use, returning the switch from the ONE position to the STBY. position causes the data obtained from the single measurement to be transferred to the recording device. The EXT. position is ineffective on the Series X-1 models without remote control and printout capabilities.

Function Switch

The FUNCTION switch is a six-position switch provided to manually select the five functions of either DC, RATIO, MV, AC, or KΩ; the sixth position (REMOTE) is provided to allow the function selection to be made by an external triggering device.

MV Offset Control

The MV OFFSET control is a screwdriver-adjust potentiometer provided to zero the instrument when in the MV function. Its use is described in the MV calibration instructions.

KΩ Offset Control

The KΩ OFFSET control is a screwdriver-adjust potentiometer provided to zero the instrument when in the KΩ function. Its use is described in the KΩ calibration instructions.

AC Offset Control

The AC OFFSET control is a screwdriver-adjust potentiometer provided to zero the instrument when in the AC function. Its use is described in the AC calibration instructions.

POWER SUPPLY UNIT

Power Switch (DVM P/N's 36-646, 36-771 and 36-874).

The power switch is a two-position toggle switch located on the rear of the power supply unit. In the OFF position, the instrument is de-energized and both power leads are isolated from the power source; however, connection is maintained between the outer chassis and AC power line ground. In the ON position, the instrument is ready to provide readings. For maximum specified accuracy, a warm-up period of 30 minutes is recommended.

CHAPTER III

CALIBRATION

In the calibration instructions provided in this chapter, it is assumed that the instrument is in good working order and only requires calibration. If any components are defective, it may be difficult, if not impossible, to calibrate the instrument properly.

SCOPE

The basic DC calibration procedure is divided into six distinct areas: zero offset adjustments; 10-volt range calibration for a positive input; 10-volt range calibration for a negative input; 100-volt range calibration; 1000-volt range calibration; and zero offset readjustment with DVM in outer chassis.

Since the Series X-1 instruments, described in this manual, are capable of ratio, millivolts, AC and ohms measurements, at customer option, calibration procedures for these accessories are also included.

NOTE

Due to the mercury-wetted relay, used for polarity switching, the mounting position of the DVM must be restricted to within 30^{o} of horizontal.

DC VOLTAGE CALIBRATION

EQUIPMENT REQUIRED

1. A voltage standard between 9.0000 volts and 11.9998 volts, to calibrate the 10-volt range.
2. A voltage standard between 90.000 volts and 119.998 volts, to calibrate the 100-volt range.
3. A voltage standard between 900.00 volts and 1000.00 volts, to calibrate the 1000-volt range.

NOTE

It should be noted that the error in making a measurement with the Series X-1 DVM can be as much as the stated accuracy of the instrument plus the accuracy of the voltage standards used in its calibration.

INITIAL PREPARATION

Calibration with Drawers in Outer Chassis

Calibration may be made with the drawers removed from the outer chassis as described below, however the instrument should be calibrated with the drawer assemblies installed in the outer chassis. The blue plastic outer cover over the Function Unit Assembly (right hand drawer) may be removed to provide labeled access holes (Figure 3-1) for each calibration adjustment on plug-in module assemblies. To remove the outer cover and begin calibration, perform the following steps (Figure 3-2):

1. Remove the four white nylon screws from the center plastic divider on top of the instrument.

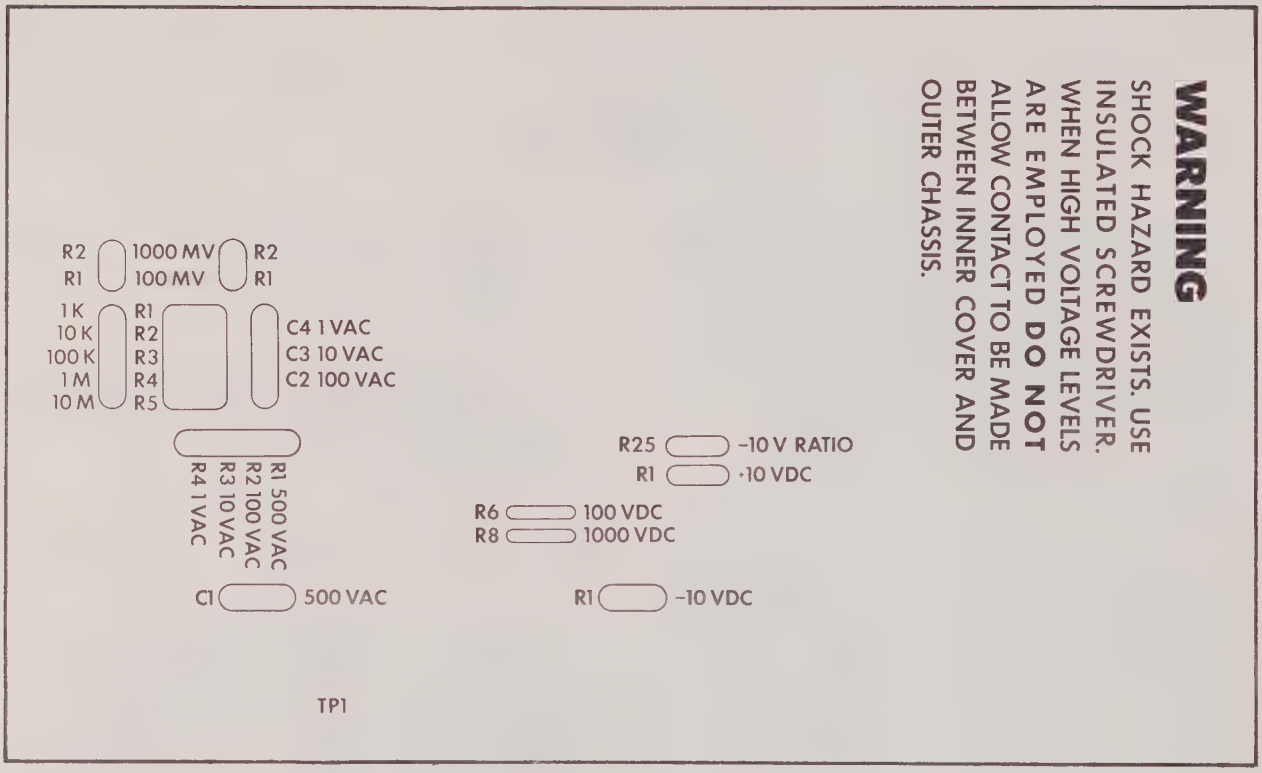
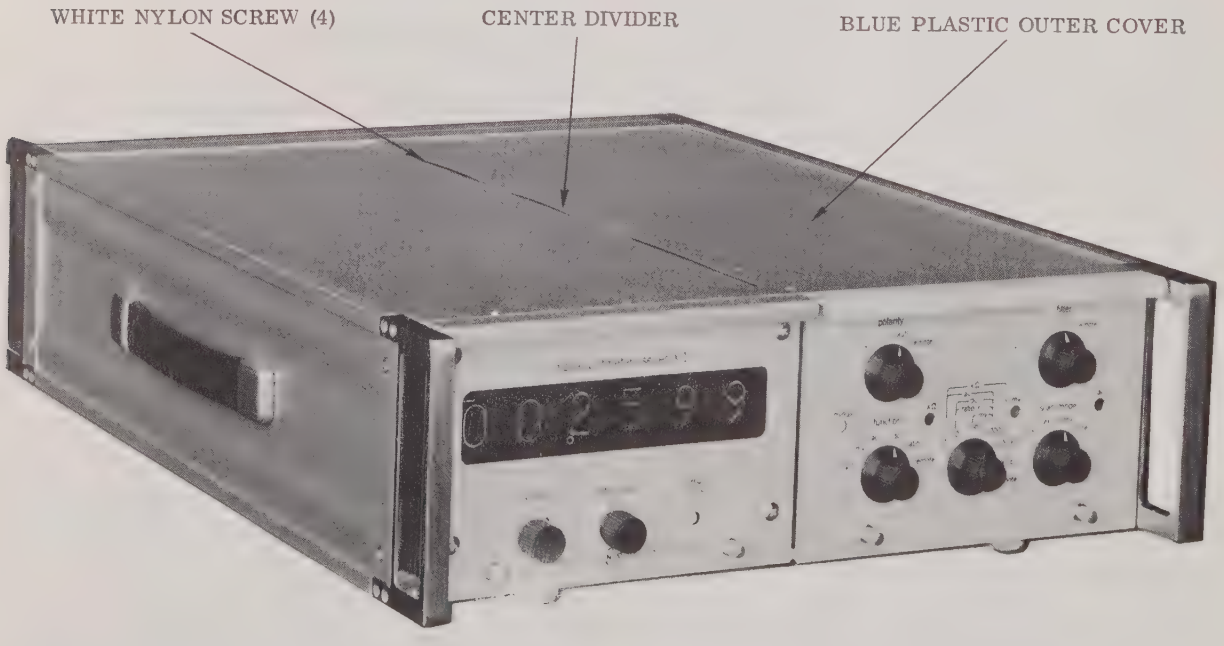

WARNING
SHOCK HAZARD EXISTS. USE INSULATED SCREWDRIVER. WHEN HIGH VOLTAGE LEVELS ARE EMPLOYED DO NOT ALLOW CONTACT TO BE MADE BETWEEN INNER COVER AND OUTER CHASSIS.
R2 R1 1000 MV 100 MV R2 R1
1 K 10 K 100 K 1 M 10 M R1 R2 R3 R4 R5
C4 1 VAC
C3 10 VAC
C2 100 VAC
R4 1 VAC R3 10 VAC R2 100 VAC R1 500 VAC
C1 500 VAC
R25 -10 V RATIO
R1 +10 VDC
R6 100 VDC
R8 1000 VDC
R1 -10 VDC
TP1

Figure 3-1. Labeled Access Holes on Inner Cover



3600-104

Figure 3-2. Outer Cover Removal

2. Remove the divider.

3. Grasp the right hand outer cover at its center where the divider has been installed.

4. Carefully bow the cover upward and pull it away from the side edge of the instrument.

5. Continue to bow the cover until it becomes loosened from the front and rear edges of the instrument.

WARNING

Shock hazard exists. Use insulated screwdriver when high voltage levels are employed. DO NOT allow contact to be made between inner cover and outer chassis.

6. Turn the instrument on and allow 30 minutes for warm-up, then begin calibration as described under paragraph headed PROCEDURE.

The cover may be replaced in the reverse order of removal, however if one of the white nylon screws has been lost, NEVER use a metal screw in its place. A metal screw in contact with the inner cover would produce the shock hazard described in the above warning.

Calibration with Drawers Removed

CAUTION

Do not disconnect drawer assemblies with power on. Damage to plug-in modules may result.

1. Loosen (turn counterclockwise) the two fasteners (Figures 2-3 and 2-4) on each of the three drawers and remove the drawers from the outer chassis of the instrument.

NOTE

To remove the Power Supply Drawer, it will first be necessary to remove two screws attaching the drawer to the outer chassis (one each is located in the center of the extreme outside edges of the rear of the drawer).

2. Connect the three drawers together and plug the power cord into a 115 VAC, 50-60 Hz power source.

3. Turn the instrument on and allow 30 minutes for warm-up.

PROCEDURE

Zero Offset Adjustments

1. Place FUNCTION switch in the DC position.

2. Place SCAN MODE switch in the INT. position.

3. Place RANGE switch in the 10 position.

4. Turn THRESHOLD potentiometer adjustment fully counterclockwise.

5. Place POLARITY switch in the plus (+) position.

6. Connect the red, black and blue clips of the DVM input cable together. Rotate the OFFSET PLUS potentiometer to a position which causes the readout to alternate between +00. 0000 and +00. 0001, then rotate the potentiometer approximately 10 degrees counterclockwise.

7. Place the POLARITY switch in the minus (-) position.

8. Rotate the OFFSET MINUS potentiometer to a position which causes the readout to alternate between -00. 0000 and -00. 0001, then rotate the potentiometer approximately 10 degrees counterclockwise.

9. This completes the zero offset adjustments. If the adjustments have been made correctly, the readout should display a steady + or -00.0000 with the input leads shorted together and the POLARITY switch in the AUTO position.

10-Volt Range Calibration for a Positive Input Voltage

1. Connect the "guard" (blue) and "input low" (black) clips of the DVM input cable to the negative terminal of the voltage standard described in paragraph 1 under Equipment Required. Connect the "input high" (red) clip to the positive terminal (Figure 3-3).

2. Place the POLARITY switch in the plus (+) or AUTO position.

3. The numerical value displayed in the readout should be equal to the voltage of the voltage standard. If it is not, adjust potentiometer R1 of the Reference Assembly (P/N 36-11) until the readout displays the correct value. If the instrument has a Ratio measurement function, the adjustment potentiometer will be R1 of the Ratio Reference Assembly (36-195). See Figure 3-4 for location of major subassemblies and adjustment potentiometers for this step and for appropriate following steps in these procedures.

10-Volt Range Calibration for a Negative Input Voltage

1. Reverse the connections to the voltage standard.

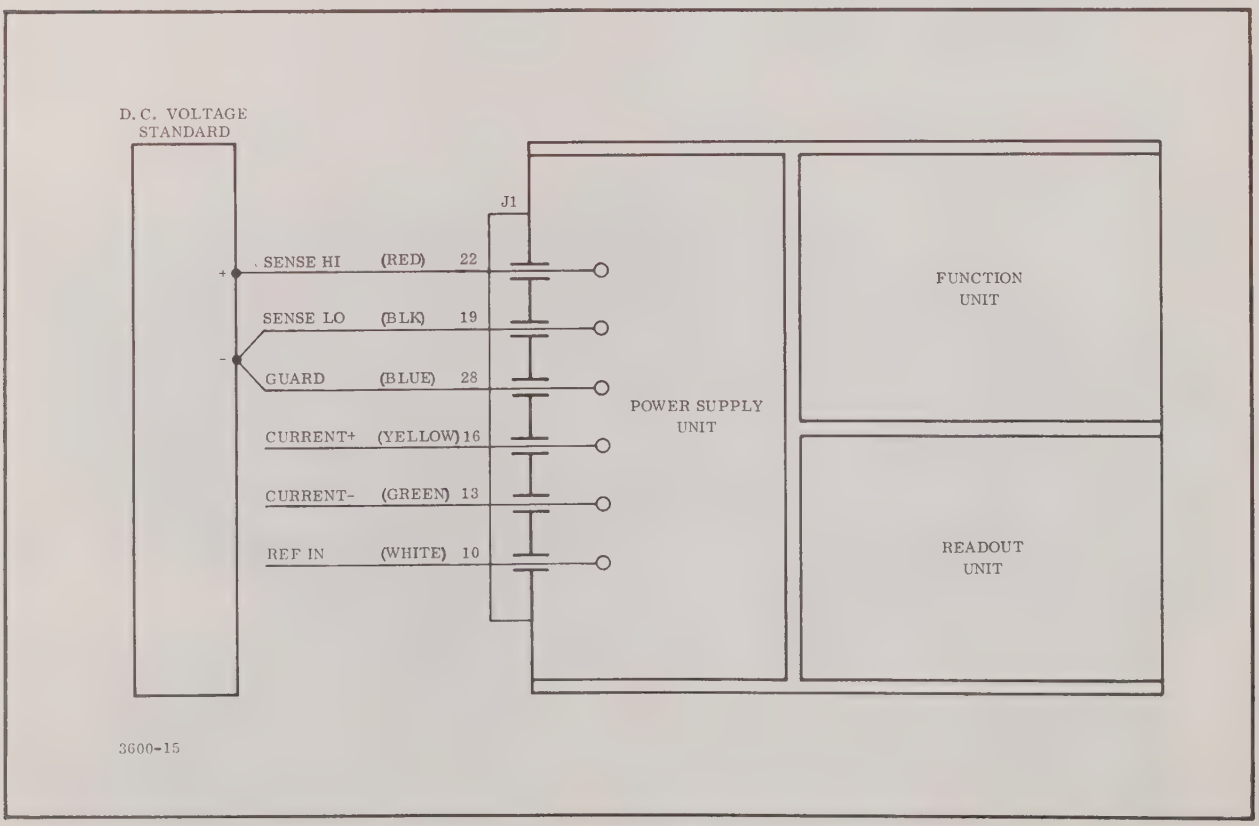


Figure 3-3. DC Volts and MV Calibration Cable Connections

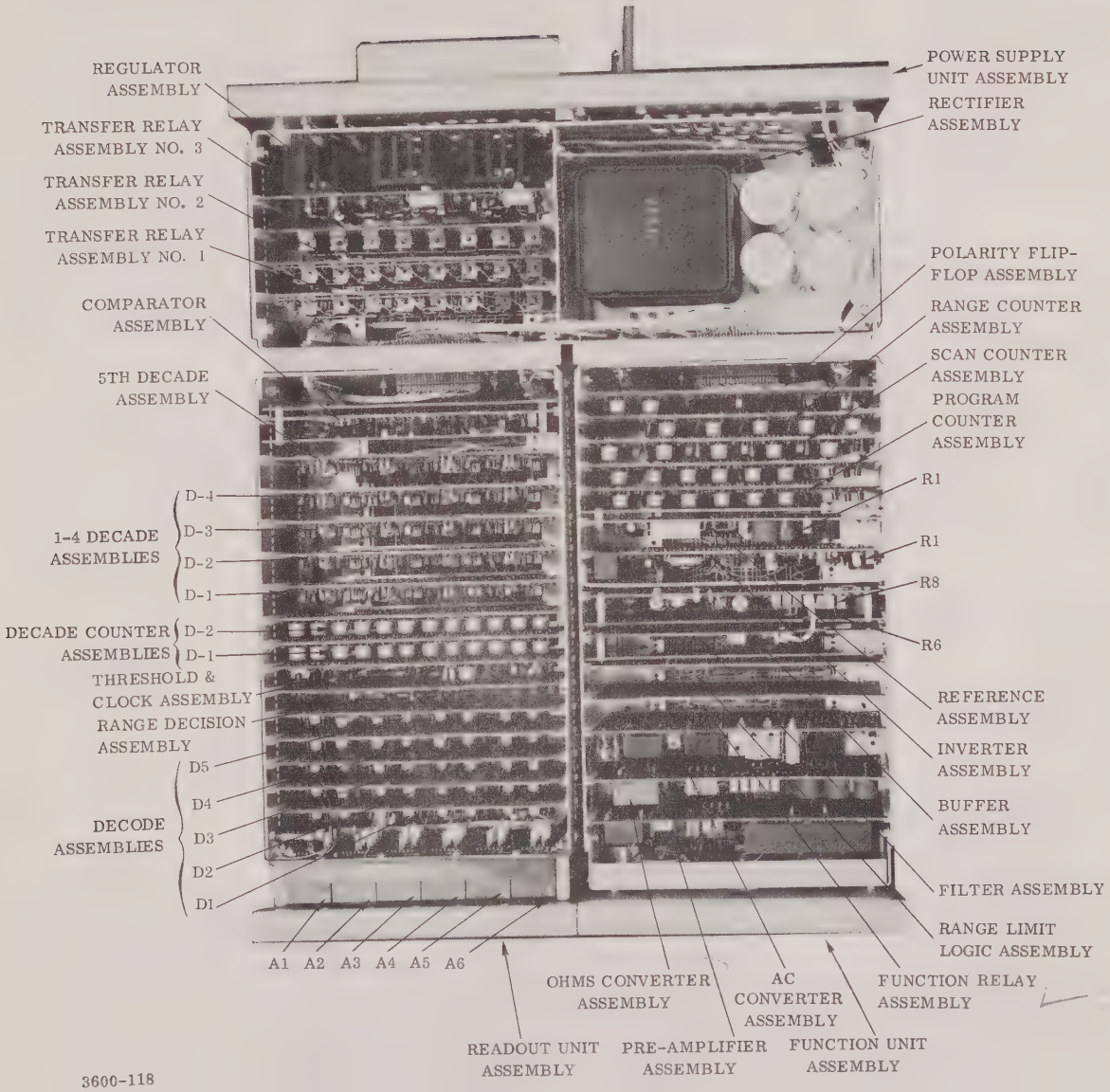


Figure 3-4. Location of Assemblies and DC Voltage Adjustment Points

2. Place the POLARITY switch in the minus (-) or AUTO position.

3. The numerical value displayed in the readout should be equal to the voltage of the voltage standard. If it is not, adjust potentiometer R1 of the Inverter Assembly (P/N 36-43) until the readout displays the correct value.

WARNING

Use extreme caution in performing the following steps as dangerously high voltages will be employed.

100-Volt Range Calibration

1. Place the POLARITY switch in the plus (+) or AUTO position.

2. Place the RANGE switch in the 100 position.

3. Connect the "guard" (blue) and "input low" (black) clips of the DVM input cable to the negative terminal of the voltage standard described in paragraph 2 under Equipment Required. Connect the "input high" (red) clip to the positive terminal (Figure 3-3).

4. The numerical value displayed in the readout should be equal to the voltage of the voltage standard. If it is not, adjust potentiometer R6 of the Buffer Assembly (P/N 36-555) until the readout displays the correct value.

WARNING

Use extreme caution in performing the following steps as dangerously high voltages will be employed.

1000-Volt Range Calibration

1. Ensure that the POLARITY switch remains in the plus (+) or AUTO position.

2. Place the RANGE switch in the 1000 position.

3. Connect the "guard" (blue) and "input low" (black) clips of the DVM input cable to the negative terminal of the voltage standard described in paragraph 3 under Equipment Required. Connect the "input high" (red) clip to the positive terminal (Figure 3-3).

4. The numerical value displayed in the readout should be equal to the voltage of the voltage standard. If it is not, adjust potentiometer R8 of the Buffer Assembly (P/N 36-555) until the readout displays the correct value.

Zero Offset Readjustment with DVM in Outer Chassis

1. Place the three drawers of the DVM into the outer chassis.

2. Ensure 30 minutes for instrument warm-up.

3. Perform steps 1 through 8 and note step 9 under Zero Offset Adjustments. This completes the basic calibration of the DVM.

RATIO CALIBRATION

ADDITIONAL EQUIPMENT REQUIRED

1. None.

INITIAL PREPARATION

1. Ensure that the instrument is properly calibrated in the DC voltage measurement function.

2. Either perform steps 1 thru 6 under Calibration with Drawers in Outer Chassis or steps 1 thru 3 under Calibration with Drawers Removed.

PROCEDURE

1. Connect the clips of the DVM input cable as shown in Figure 3-5 to the voltage standard described in paragraph 1 under Equipment Required, DC Voltage Calibration.

2. Place the SCAN MODE switch in the INT. position.

3. Place the POLARITY switch in the negative (-) position.

4. Place the FILTER switch in the OUT position.

5. Place the FUNCTION switch in the RATIO position.

6. Turn the THRESHOLD potentiometer adjustment fully counterclockwise.

7. Place the RANGE switch in the 10 position.

8. Apply 10 volts and adjust R25 of the Ratio Reference Assembly (Figure 3-6) until the readout displays -10.0000. This step completes the calibration of the Ratio Reference Assembly.

PREAMPLIFIER CALIBRATION

ADDITIONAL EQUIPMENT REQUIRED

1. A voltage standard between 90.000 millivolts and 119.998 millivolts, to calibrate the 100-millivolt range.

2. A voltage standard between 900.00 millivolts and 1199.98 millivolts, to calibrate the 1000-millivolt range.

INITIAL PREPARATION

1. Ensure that the instrument is properly calibrated in DC voltage measurement function.

2. Either perform steps 1 thru 6 under Calibration with Drawers in Outer Chassis or steps 1 thru 3 under Calibration with Drawers Removed.

PROCEDURE

1. Place the SCAN MODE switch in the INT. position.

2. Turn the THRESHOLD potentiometer adjustment fully clockwise.

3. Place the RANGE switch in the 100 MV position.

4. Place the FUNCTION switch in the MV position.

5. Place the POLARITY switch in the AUTO position.

6. Place the FILTER switch in the OUT position.

7. Connect the red, black and blue clips of the DVM input cable together. Adjust the MV OFFSET potentiometer until the readout displays 000.000.

8. Connect the clips of the DVM input cable as shown in Figure 3-3 to the voltage standard described in paragraph 1 under Additional Equipment Required.

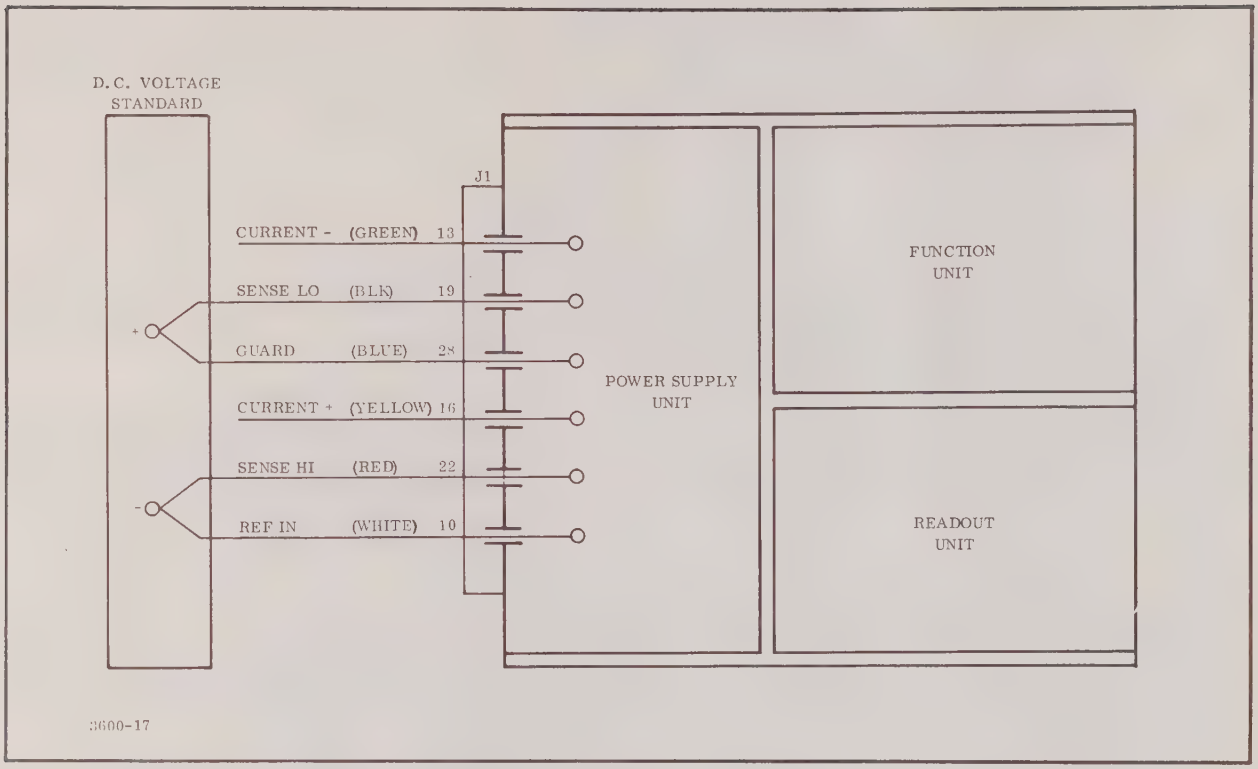


Figure 3-5. Ratio Reference Assembly Calibration Cable Connections

9. Apply approximately 95.000 millivolts and adjust R1 of the Pre-Amplifier Assembly (Figure 3-7) until the numerical value displayed in the readout is equal to the voltage of the voltage standard.

10. Connect the clips of the DVM input cable as shown in Figure 3-3 to the voltage standard described in paragraph 2 under Additional Equipment Required.

11. Place RANGE switch in the 1000 position. Apply approximately 950.000 millivolts and adjust R2 of the Pre-Amplifier Assembly (Figure 3-7) until the numerical value displayed in the readout is equal to the voltage of the voltage standard. This step completes the calibration of the Pre-Amplifier Assembly.

OHMS CONVERTER CALIBRATION

ADDITIONAL EQUIPMENT REQUIRED

1. An ohms standard accurate to 0.01%. The values required are called out in each calibrating step.

INITIAL PREPARATION

1. Ensure that the instrument is properly calibrated in the DC voltage measurement function.

2. Either perform steps 1 thru 6 under Calibration with Drawers in Outer Chassis or steps 1 thru 3 under Calibration with Drawers Removed.

PROCEDURE

1. Place the SCAN MODE switch in the INT. position.

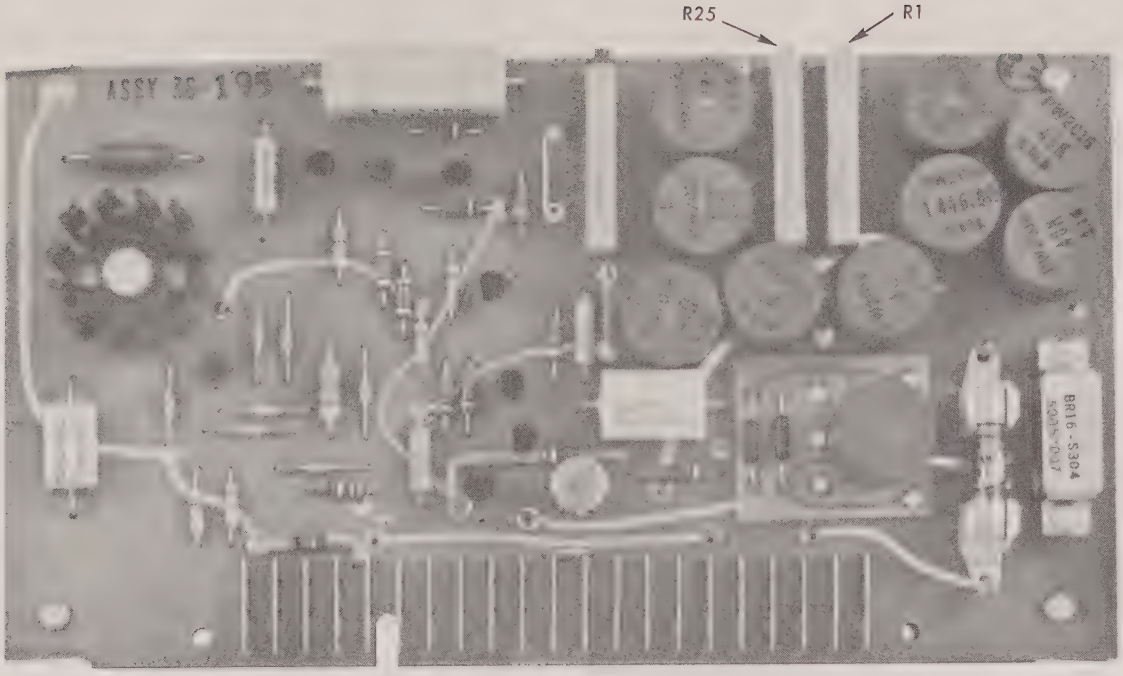


Figure 3-6. Ratio Reference Assembly Adjustment Points

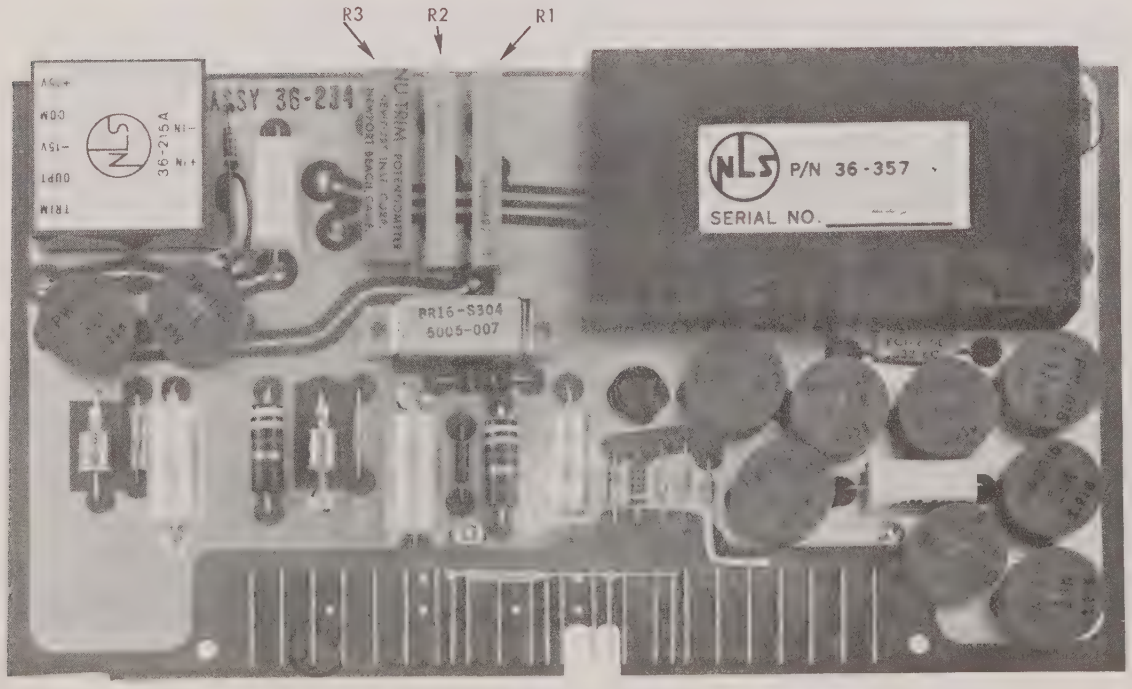


Figure 3-7. Pre-Amplifier Assembly Adjustment Points

2. Turn the THRESHOLD potentiometer adjustment fully counterclockwise.

3. Place the FUNCTION switch in the KΩ position.

4. Place the FILTER switch in the OUT position.

5. Place the RANGE switch in 1K range.

NOTE

The 1K range is displayed on the front panel as the numeral 1 since the ohms ranges are in KΩ. Also, the numerals 10 and 100 represent the 10K and 100K ranges respectively and the 1000 and 10000 displays represent the 1 MEG and 10 MEG ranges respectively.

6. Connect the red, yellow, black and green leads of the DVM together. Adjust the KΩ OFFSET potentiometer until the readout displays 00.0000.

7. Connect the clips of the DVM input cable to the ohms standard as shown in Figure 3-8.

8. Apply approximately .90000KΩ and adjust R1 of the Ohms Converter Assembly (Figure 3-9) until the numerical value displayed in the readout is equal to the ohmic value applied.

9. Place RANGE switch in the 10K range. Apply approximately 9.0000KΩ and adjust R2 of the Ohms Converter Assembly (Figure 3-9) until the numerical value displayed in the readout is equal to the ohmic value applied.

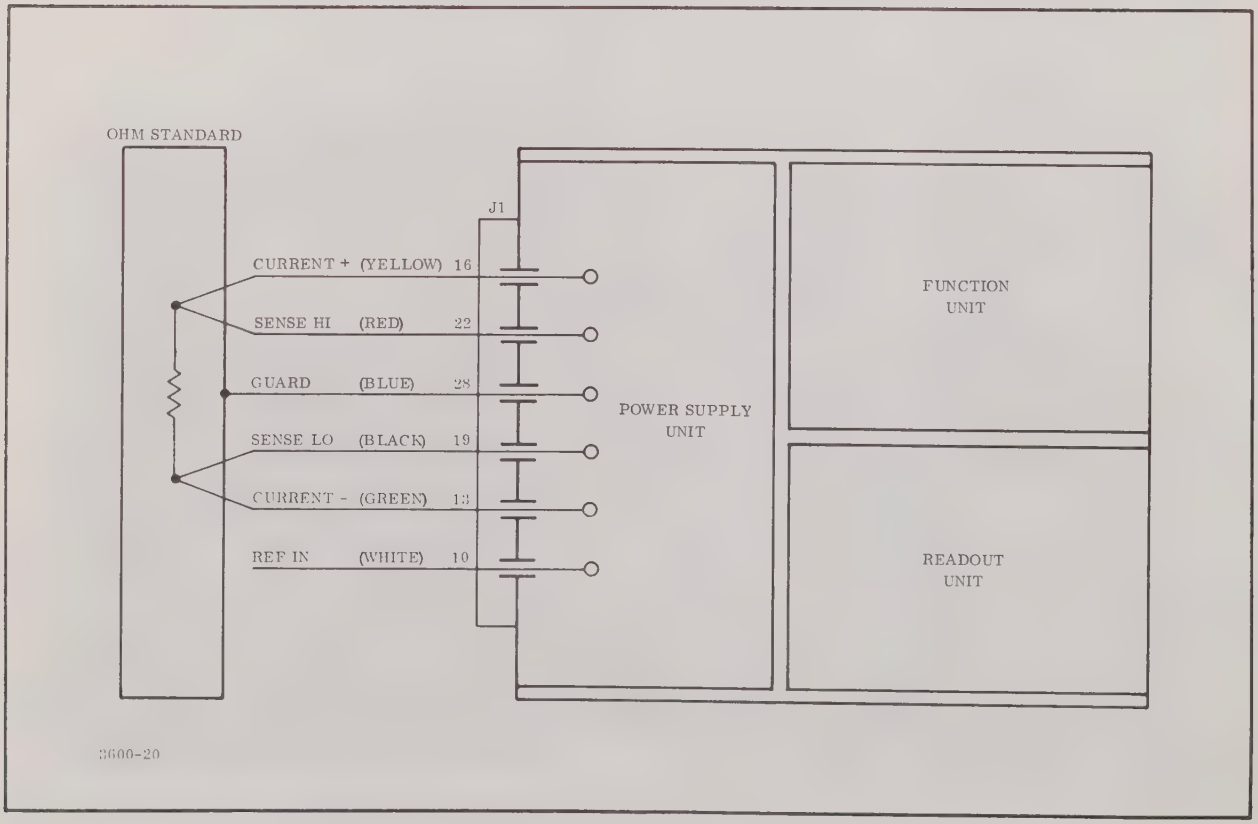


Figure 3-8. Ohms Converter Assembly Calibration Cable Connections

10. Place RANGE switch in the 100K range. Apply approximately 90.000KΩ and adjust R3 of the Ohms Converter Assembly (Figure 3-9) until the numerical value displayed in the readout is equal to the ohmic value applied.

11. Place RANGE switch in the 1 MEG range. Apply approximately 900.00KΩ and adjust R4 of the Ohms Converter Assembly (Figure 3-9) until the numerical value displayed in the readout is equal to the ohmic value applied.

12. Place RANGE switch in the 10 MEG range. Apply approximately 9000.0KΩ and adjust R5 of the Ohms Converter Assembly (Figure 3-9) until the numerical value displayed in the readout is equal to the ohmic value applied.

NOTE

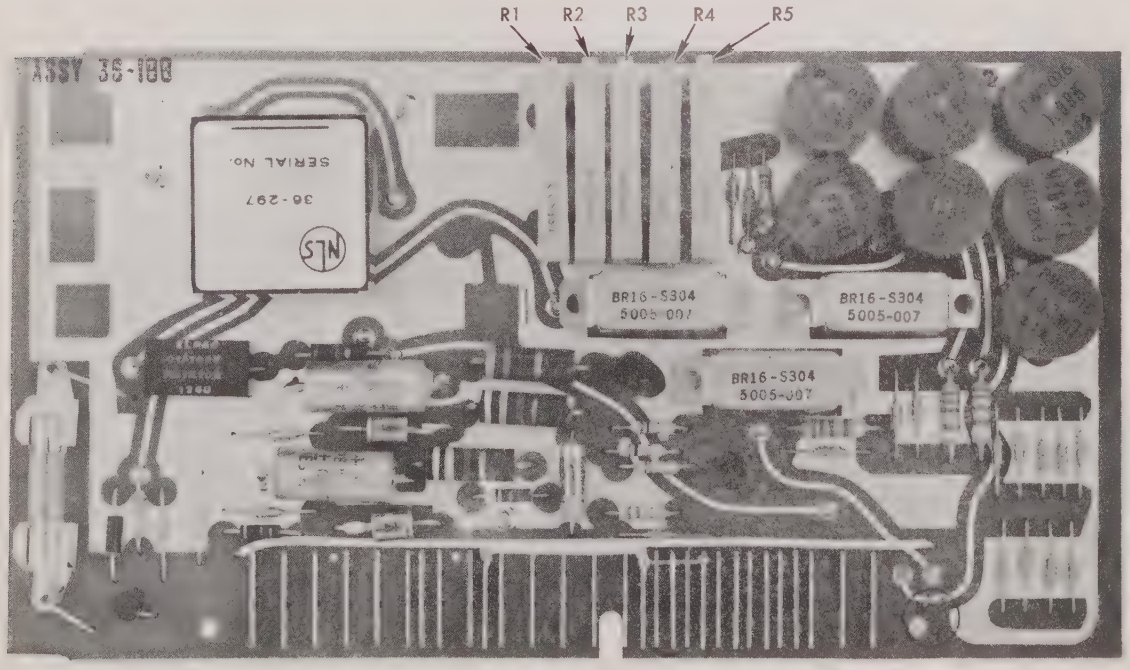
When measuring high value resistors, it may be necessary to connect the guard (blue lead) to earth ground and/or turn the filter switch to the IN position.

Step 12 completes the calibration of the Ohms Converter Assembly.

AC CONVERTER CALIBRATION

ADDITIONAL EQUIPMENT REQUIRED

1. An Audio Voltage Standard between 1 volt, 200 Hz - 10K Hz and 500 volts, 200 Hz - 10K Hz.



3600-21

Figure 3-9. Ohms Converter Assembly Adjustment Points

INITIAL PREPARATION

1. Ensure that the instrument is properly calibrated in the DC voltage measurement function.
2. Either perform steps 1 thru 6 under Calibration with Drawers in Outer Chassis or steps 1 thru 3 under Calibration with Drawers Removed.

PROCEDURE

1. Place the SCAN MODE switch in the INT. position.
2. Place the FUNCTION switch in the AC position.
3. Place the FILTER switch in the OUT position.
4. Place the RANGE switch in the 1000 position.
5. Turn the THRESHOLD potentiometer adjustment fully counterclockwise.
6. Connect the red, black and blue clips of the DVM input cable together. Adjust the AC OFFSET potentiometer until the readout displays 00. 0000.
7. Connect the clips of the DVM input cable to the audio voltage standard as shown in Figure 3-10.

WARNING

Use extreme caution in performing the following steps as dangerously high voltage will be employed.

CAUTION

Do not apply more than 500 VAC or damage to the AC Converter Assembly may result.

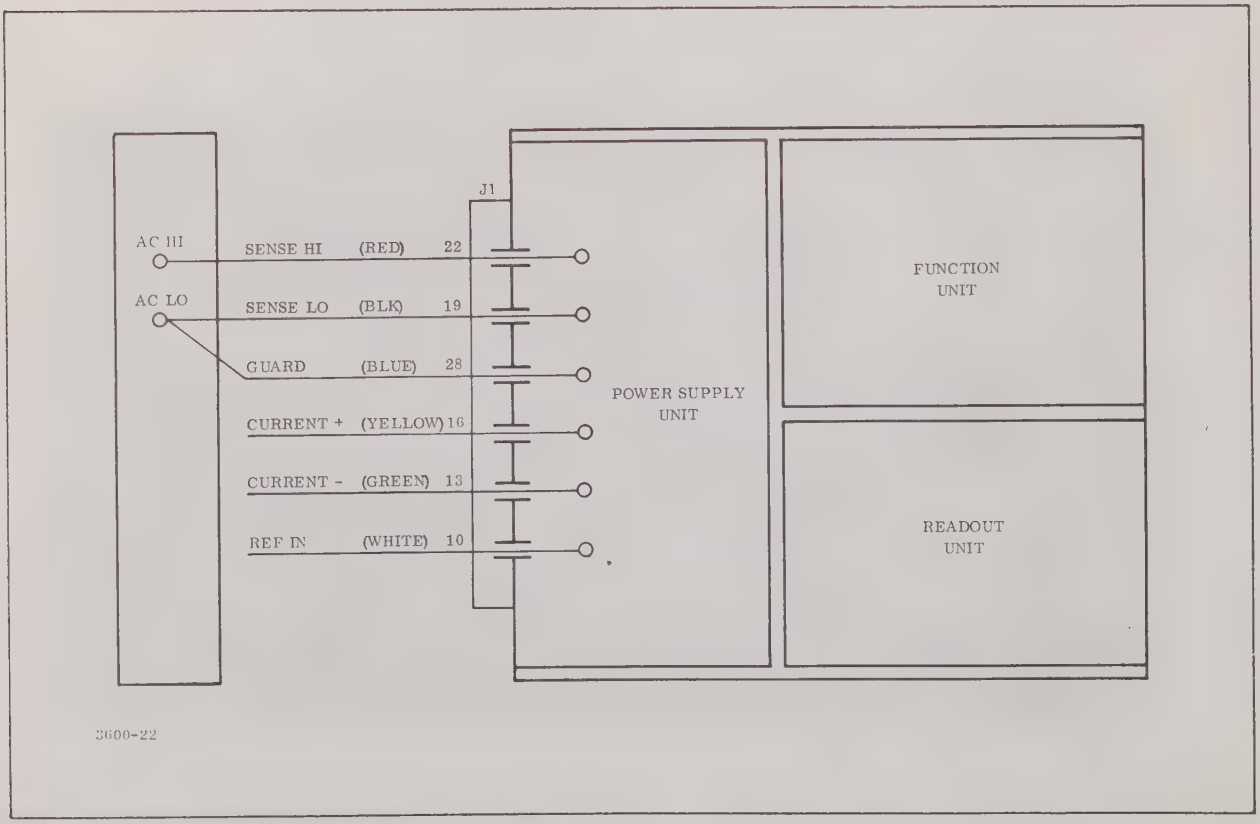


Figure 3-10. AC Converter Assembly Calibration Cable Connections

8. Apply approximately 450.00 volts, 200 Hz and adjust R1 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.

9. Apply approximately 450.00 volts, 10K Hz and adjust C1 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.

WARNING

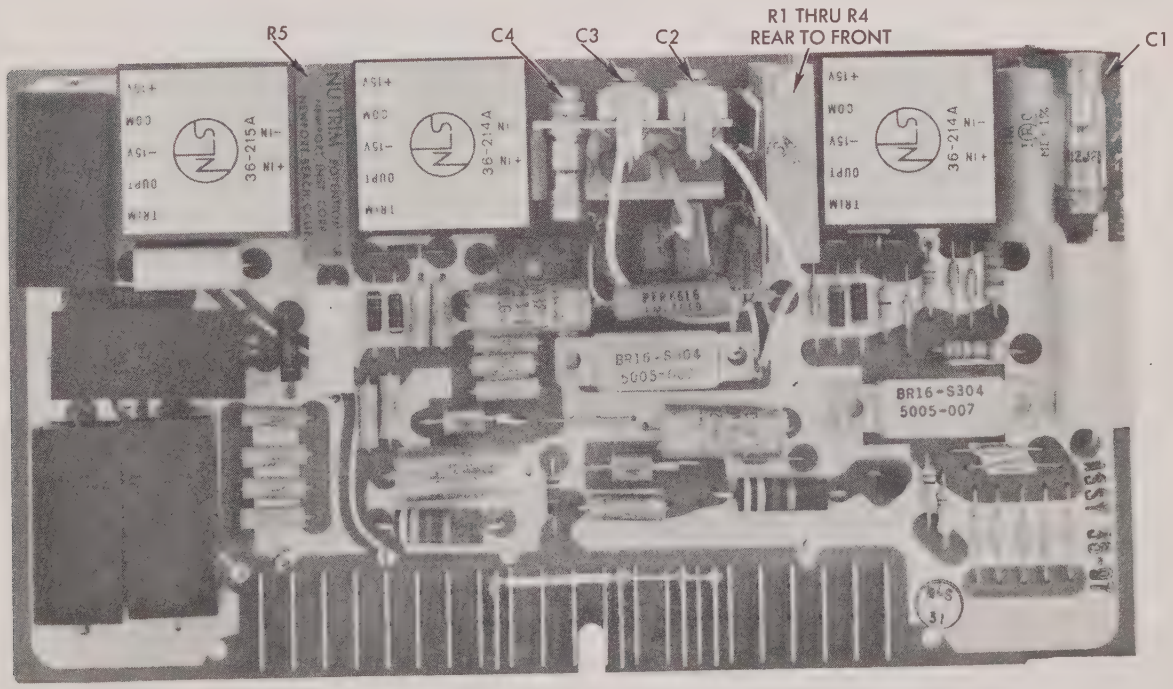
Use extreme caution in performing the following steps as dangerously high voltage will be employed.

10. Place the range switch in the 100 position. Apply approximately 90.00 volts, 200 Hz and adjust R2 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.

11. Apply approximately 90.00 volts, 10K Hz and adjust C2 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.

12. Place the range switch in the 10 position. Apply approximately 9.000 volts, 200 Hz and adjust R3 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.

13. Apply approximately 9.000 volts, 10K Hz and adjust C3 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.



3600-23

Figure 3-11. AC Converter Assembly Adjustment Points

14. Apply approximately 0.9000 volts, 200 Hz and adjust R4 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.

15. Apply approximately 0.9000 volts, 10K Hz and adjust C4 (Figure 3-11) of the AC Converter Assembly until the numerical value displayed in the readout is equal to the voltage applied.

CHAPTER IV

MAINTENANCE

In the Series X-1 Digital Voltmeter, virtually all circuit components are assembled on plug-in modules. Thus maintenance problems are simplified to the point where the instrument can be kept operating without the need for highly trained maintenance personnel. Because of this plug-in design, down-time is held to a minimum; the unit can be kept operating in locations from which it would be impractical or inconvenient to send the instrument to a repair facility or to the manufacturer. Only a very few minutes are needed to replace all of the plug-in boards. By using trial-and-error techniques the instrument can be rapidly returned to service, and the defective module repaired at a later date.

For a general understanding of the principles of operation of the Series X-1 DVM, refer to Figures 4-1 thru 4-11. For a more detailed analysis, refer to the Schematic and wiring diagrams at the end of this manual.

In order to pursue the plug-in philosophy to the fullest, spare modules as listed in Section VI, Recommended Spare Parts List, should be kept in stock.

If it is desired to measure voltages and check waveforms on a particular plug-in module, a 41-pin extension board will be required to raise the board so that pin contacts become accessible. These boards, NLS part number 1009-41, may be ordered from any NLS representative or from the NLS Main Office in Del Mar, California.

TROUBLESHOOTING

Refer to Table II.

DIGITAL READOUT MAINTENANCE

The digital readout modules do not ordinarily require maintenance other than lamp bulb replacement and an occasional cleaning. Most readouts have decals on the module cover, on the top and bottom of each readout, to show which contact is providing the signal for each digit or symbol. If decals are not provided, see Figure 4-12 for information to locate each digit or symbol contact point.

LAMP BULB REPLACEMENT

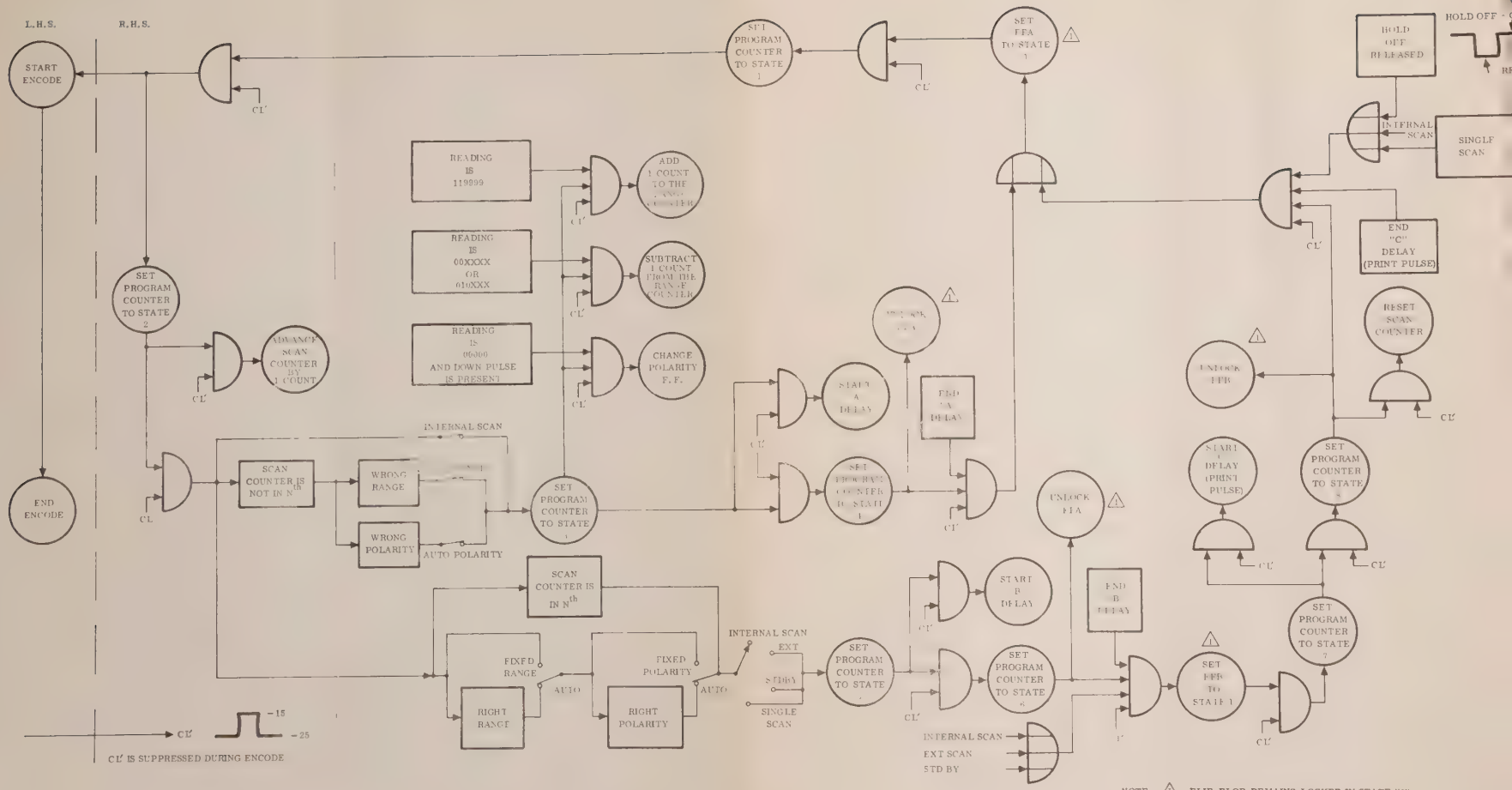
When it is determined that a digit or symbol is not illuminating within a specific readout display, the lamp bulb may be replaced by performing the following steps:

1. Remove the DIGITAL OUTPUT or POWER knob from the readout panel.

   CAUTION

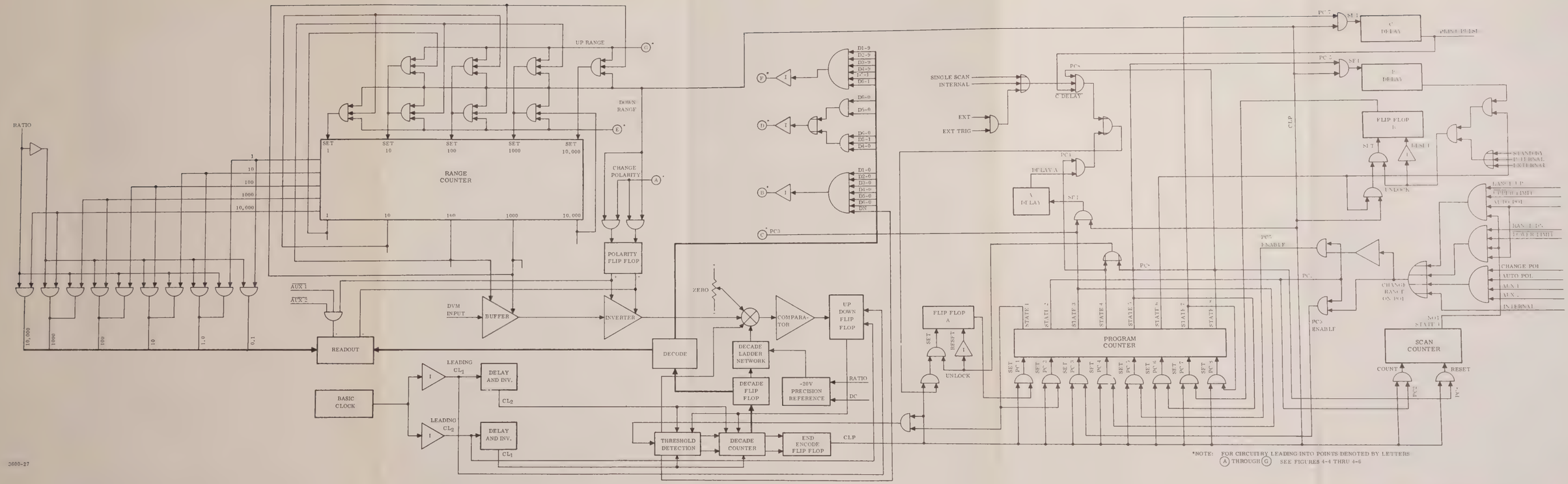
   Do not disconnect drawer assemblies with power on. Damage to plug-in modules may result.

2. Loosen (turn counterclockwise) the two fasteners on the Readout Unit Assembly.
3. Pull drawer slightly forward and then remove four screws attaching readout panel to readout drawer assembly and and remove front panel.
4. Gently withdraw readout module with defective bulb from readout plug-in board (Figure 4-13).



2600-34

Figure 4-1. Series X-1 DVM Flow Diagram



*NOTE: FOR CIRCUITRY LEADING INTO POINTS DENOTED BY LETTERS (A) THROUGH (G) SEE FIGURES 4-4 THRU 4-6

Figure 4-2. Block Diagram X-1 DVM with Printout Function

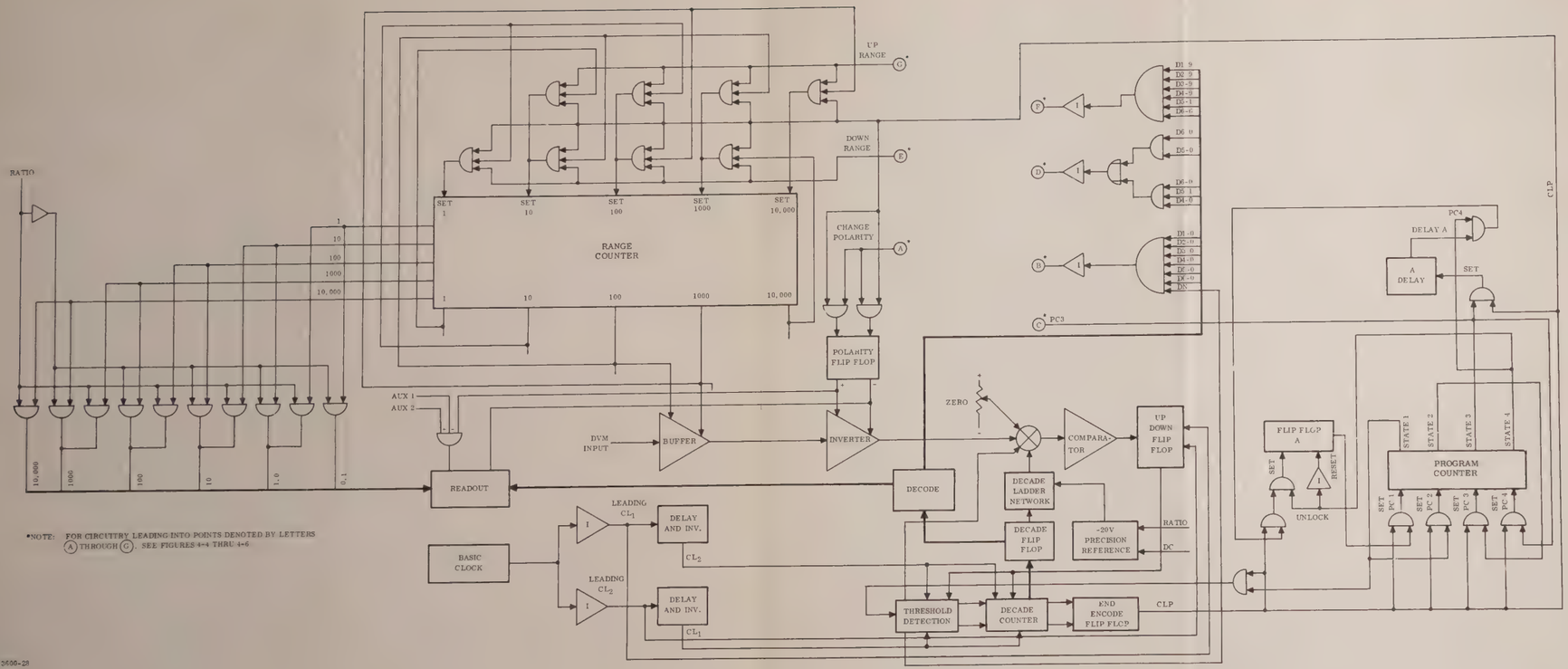


Figure 4-3. Block Diagram X-1 DVM without Printout Function

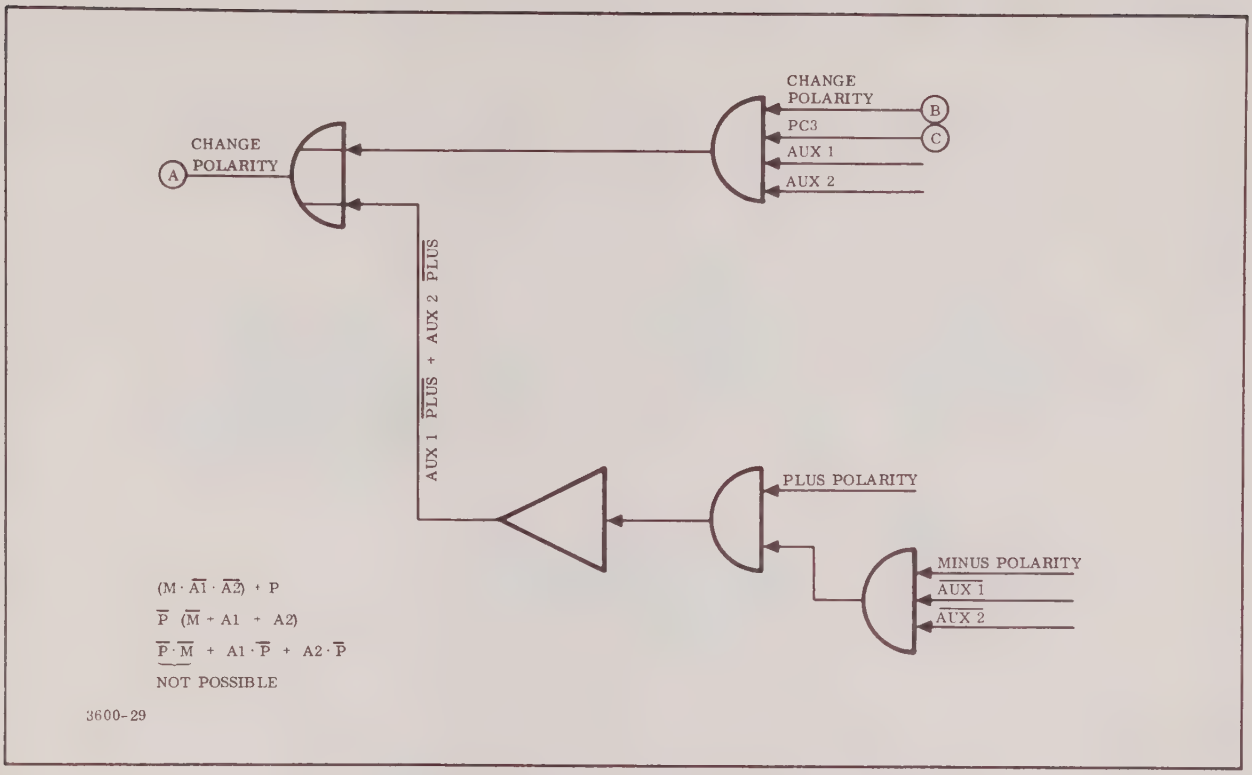


Figure 4-4. Polarity Gate

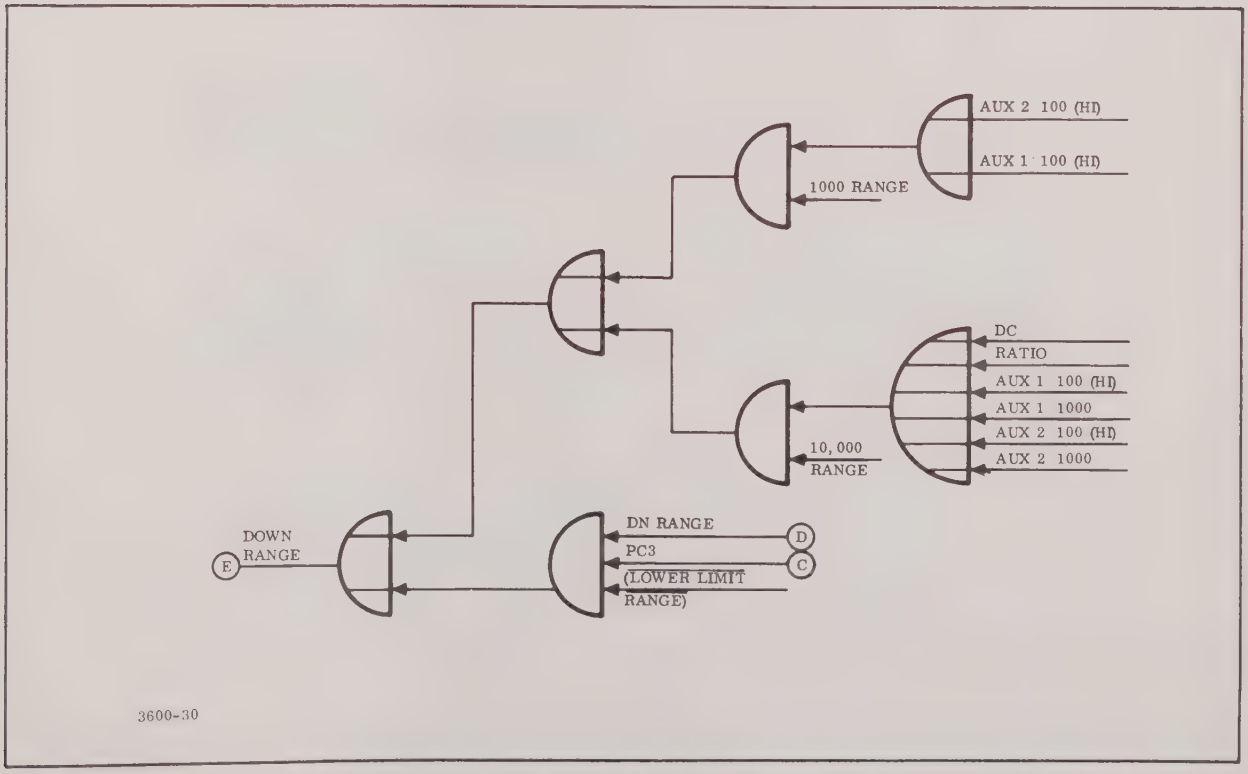


Figure 4-5. Forbidden Upper Range Gate

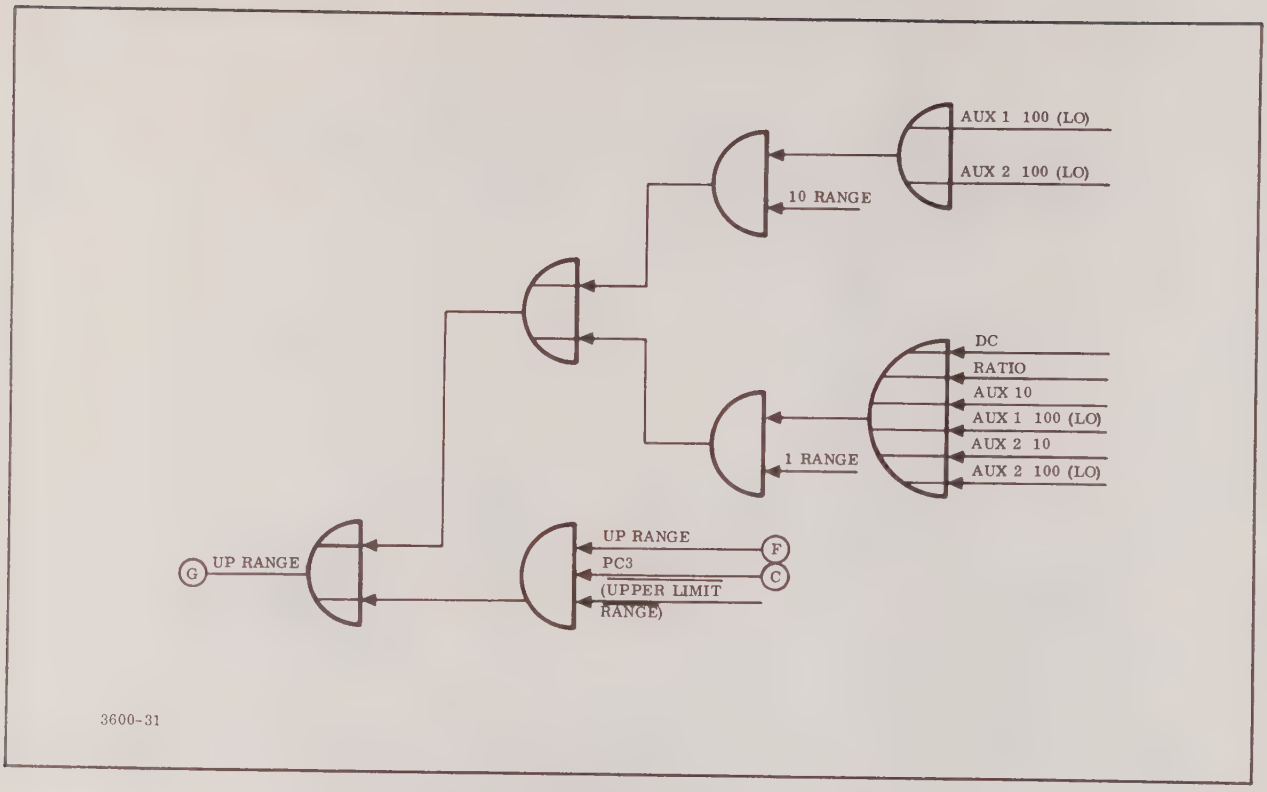


Figure 4-6. Forbidden Lower Range Gate

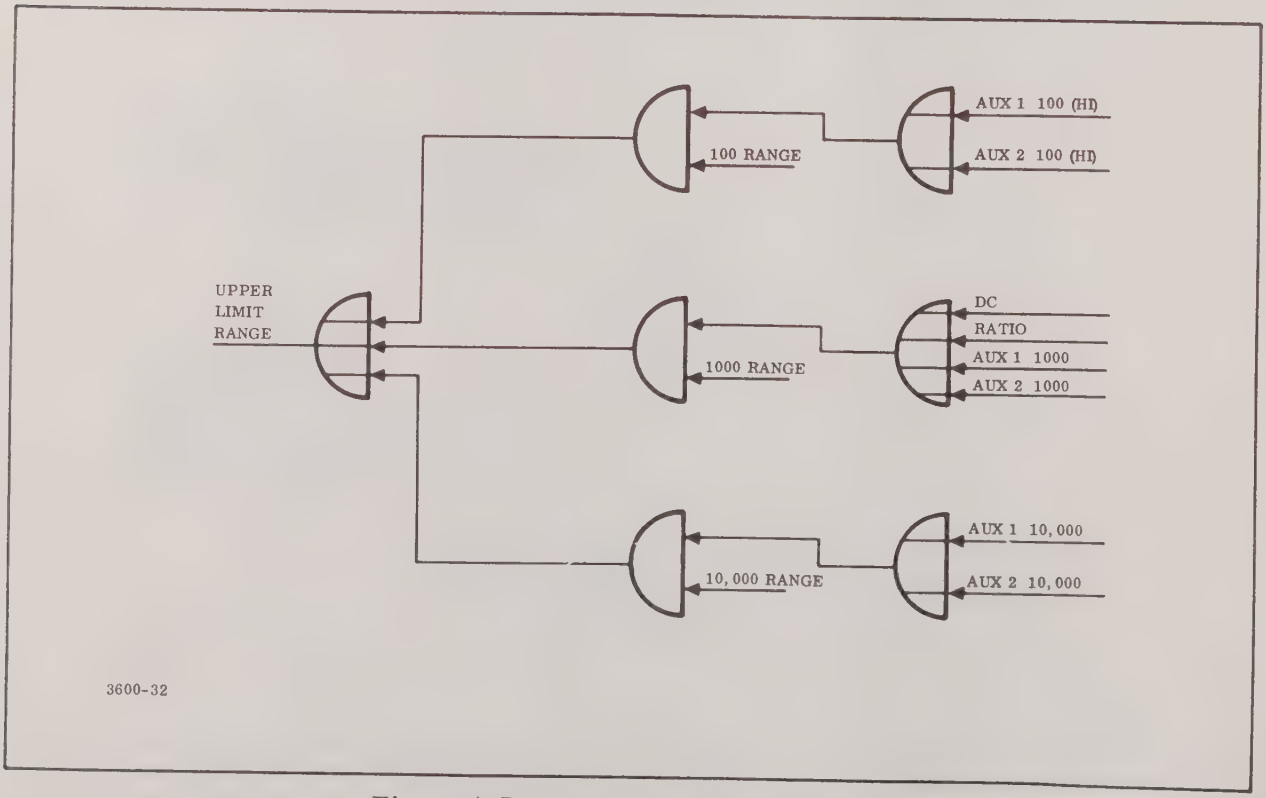


Figure 4-7. Upper Limit Range Gate

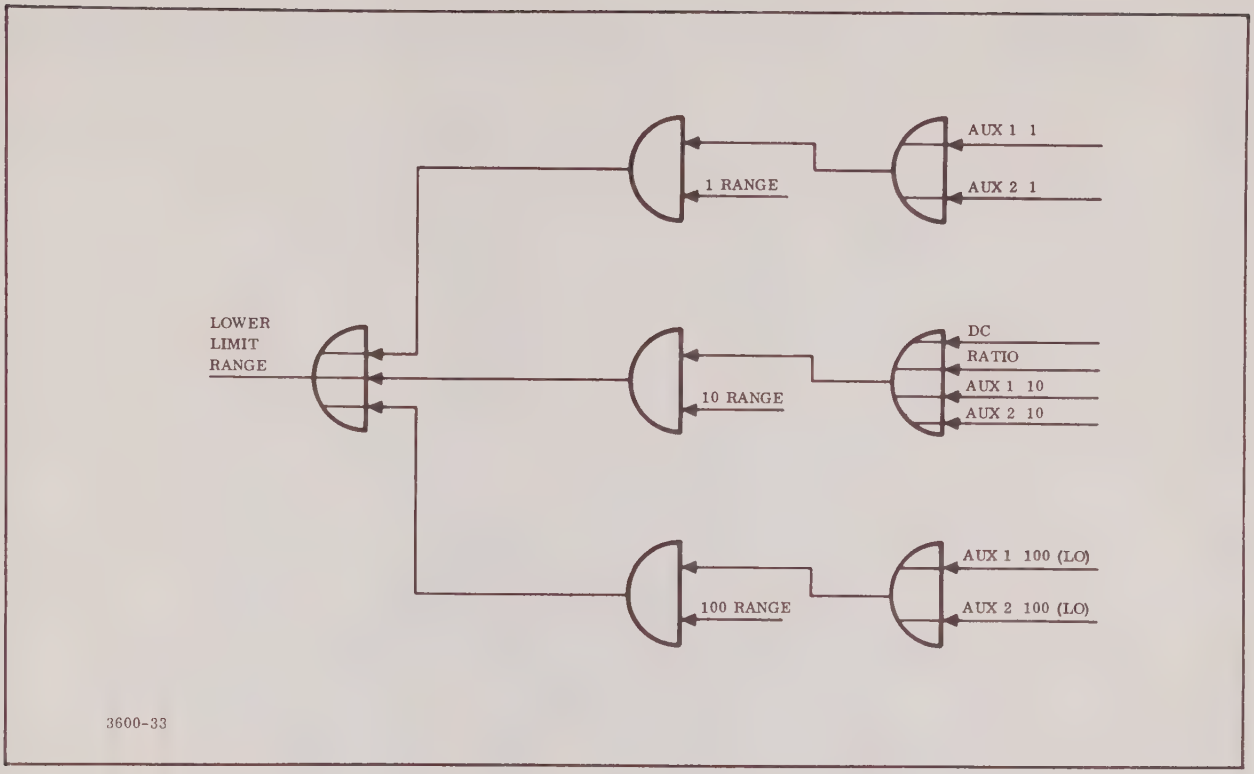


Figure 4-8. Lower Limit Range

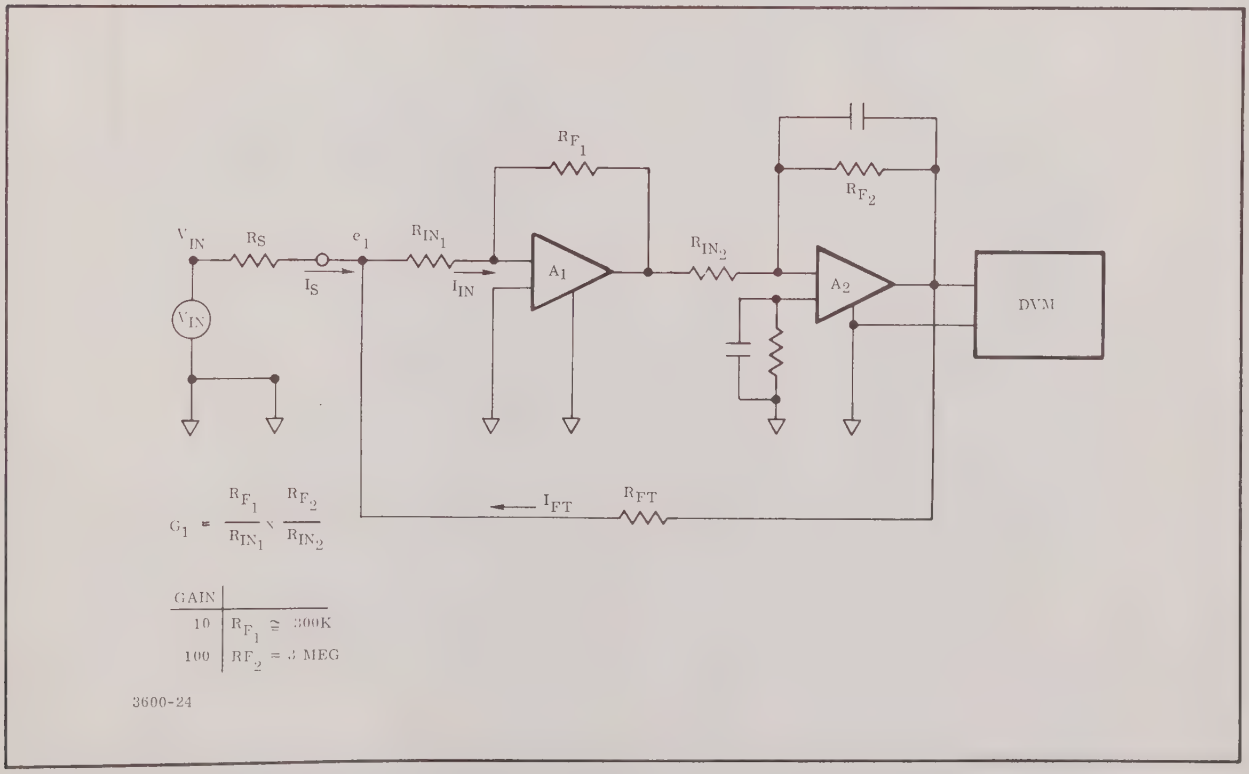
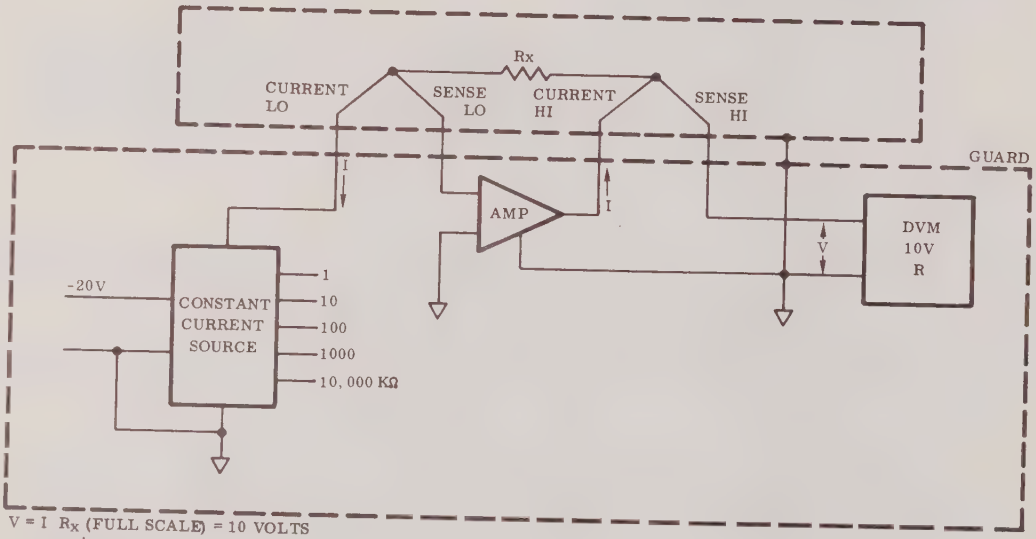


Figure 4-9. Simplified Diagram Pre-Amplifier Assembly

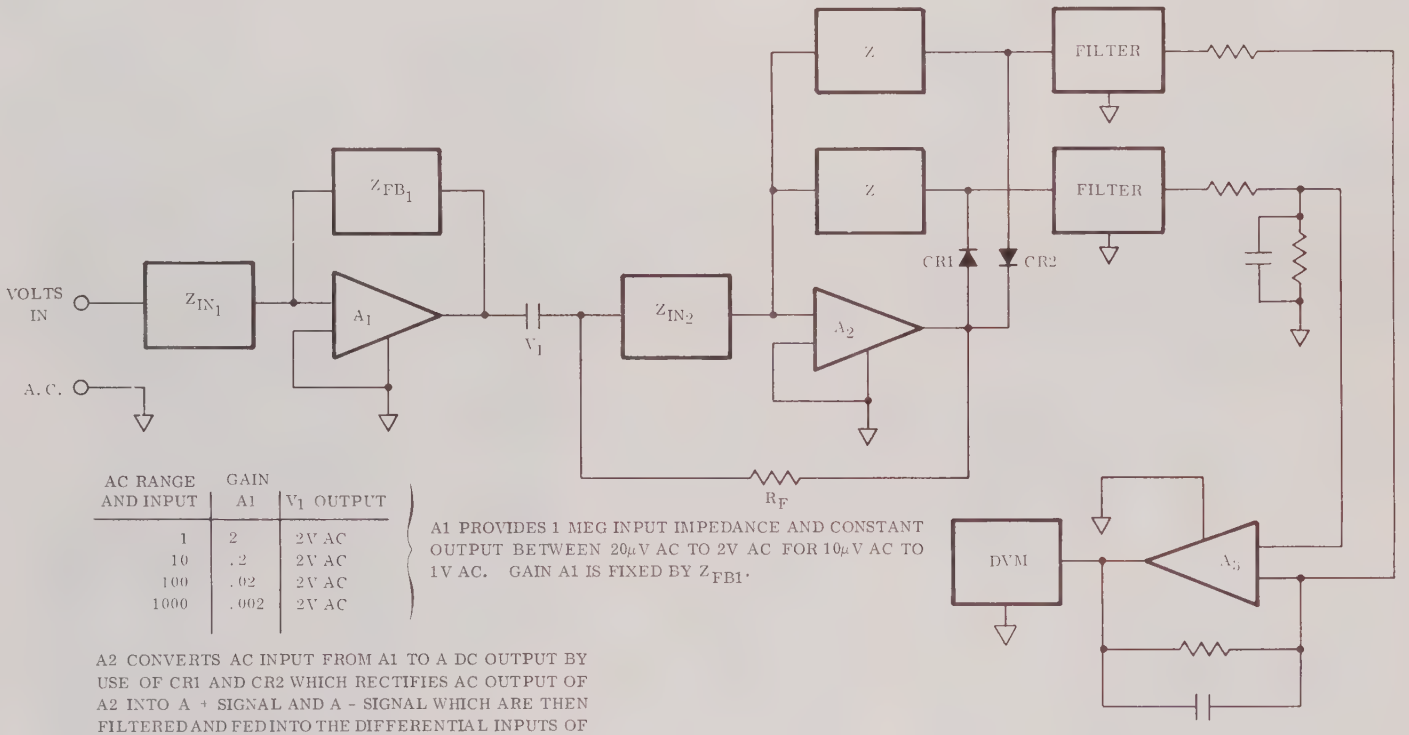


$V = I\ R_X$ (FULL SCALE) = 10 VOLTS

R_X	I
1K	10MA
10K	1MA
100K	100μA
1000K	10μA
10,000K	1μA

3600-25

Figure 4-10. Simplified Diagram Ohms Converter Assembly



AC RANGE AND INPUT	GAIN A1	V_1 OUTPUT
1	2	2V AC
10	.2	2V AC
100	.02	2V AC
1000	.002	2V AC

A1 PROVIDES 1 MEG INPUT IMPEDANCE AND CONSTANT OUTPUT BETWEEN 20μV AC TO 2V AC FOR 10μV AC TO 1V AC. GAIN A1 IS FIXED BY Z_{FB1}.

A2 CONVERTS AC INPUT FROM A1 TO A DC OUTPUT BY USE OF CR1 AND CR2 WHICH RECTIFIES AC OUTPUT OF A2 INTO A + SIGNAL AND A - SIGNAL WHICH ARE THEN FILTERED AND FED INTO THE DIFFERENTIAL INPUTS OF A3. A3 PUTS AN OUTPUT IN THE RANGE OF THE DVM (10μV TO 10 VOLTS DC).

3600-26

Figure 4-11. Simplified Diagram AC Converter Assembly

5. Locate correct contact point for defective bulb either by noting decal on readout or by referring to Figure 4-12.

6. Remove cover from readout by removing the two attaching screws (Figure 4-14).

7. Gently withdraw the lamp board assembly away from the lamp block within the readout (Figure 4-15).

8. Unsolder defective bulb and replace it with a functioning T-1-3/4 14-volt bulb.

9. Reassemble readout and replace readout, front panel and knob in reverse order of removal.

10. If for any reason the Polaroid filter is removed from between the control identification panel and the facade, care should be taken to re-install the filter so that the polarizing action is correct. Look through the filter at a piece of shiny metal, such as the chrome rim of a wrist-watch. If the metal shows a markedly violet cast, then the filter front is the surface closest to the eye.

READOUT WINDOW CLEANING

Under extremely adverse dust or humidity conditions, the individual readout windows may require cleaning. If accumulated dust particles are likely to be unusually abrasive, a camel-hair brush or artist's sable brush should first be used to remove loose dust particles. The windows may then be cleaned with commercial isopropyl alcohol and lint-free paper, such as Kimwipes 900-L, manufactured by Kimberly-Clark, Neenah, Wisconsin. The windows may also be cleaned if they are dipped in alcohol and then blown dry with compressed air.

To remove the windows from the readout, perform the following steps:

1. Perform steps 1, 2, and 3 under Lamp Bulb Replacement.

2. Perform steps 6 and 7 (both top and bottom lamp boards) under Lamp Bulb Replacement for each readout to be cleaned.

3. Remove each two sets of lamp block attaching screws.

4. Gently press against one lamp block until the other lamp block may be removed and until windows can be withdrawn with finger-tip pressure.

5. Clean the windows as set forth above.

NOTE

It is well to be systematic about this operation so as to avoid replacing the windows in improper order. Care should be taken to avoid replacing the windows backwards; this type of error is most likely to occur with windows marked 1, 0, 6, 8, 9, + or -. Note that the engraved side always faces to the rear of the readout.

6. Stack the windows in proper order and press them together with mild fingertip pressure. Avoid fingerprints on the windows. After ensuring that the numerals are right side up and that the engraved side faces the rear of the readout, gently slip the windows into the cover.

7. Perform step 9 and note step 10 under Lamp Bulb Replacement.

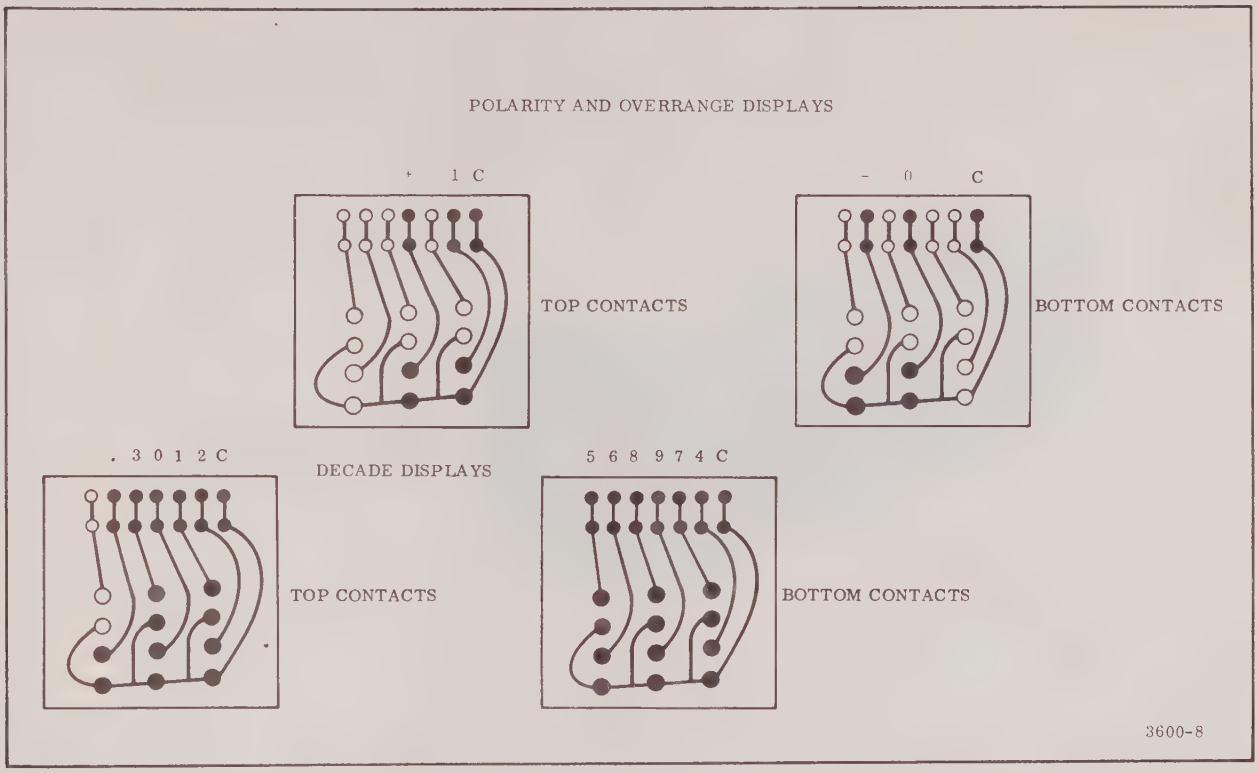


Figure 4-12. Lamp Bulb Contact Points

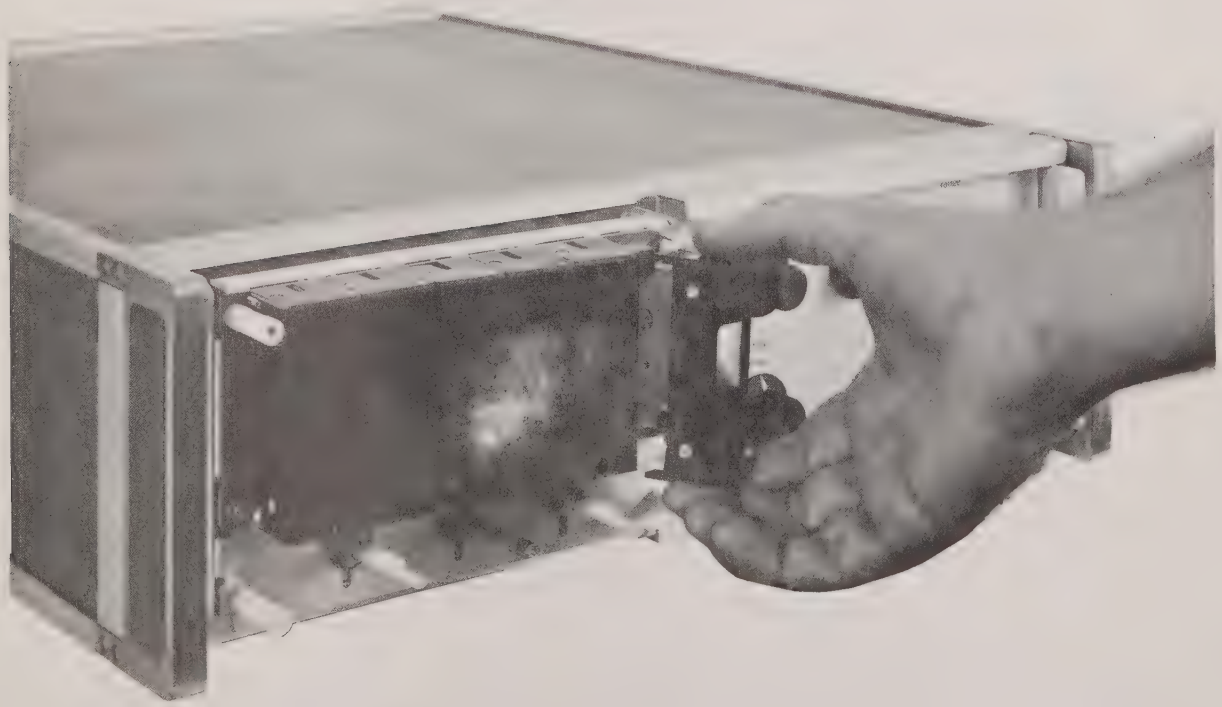


Figure 4-13. Readout Module Removal

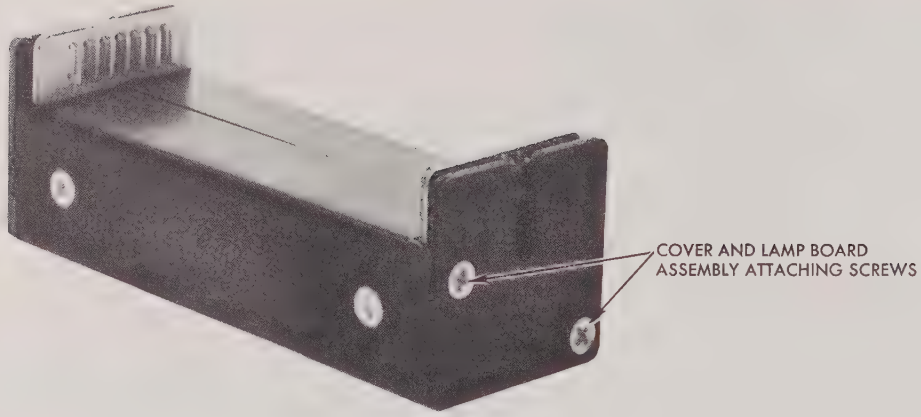


Figure 4-14. Readout Module

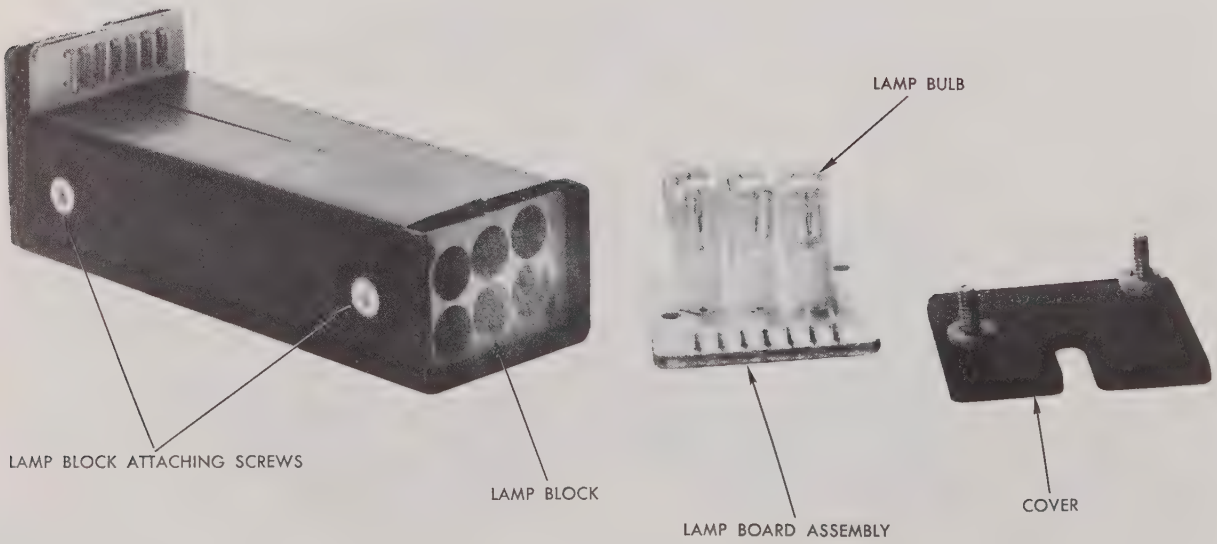


Figure 4-15. Readout Module with Cover and Lamp Board Assembly Removed

Table II. Troubleshooting

TROUBLE	PROBABLE CAUSE
Two or more lamps illuminated in single readout	Faulty Decade Counter Assembly Faulty Decode Assembly
A numeral and a dim "0" illuminated in single readout	Faulty Program Counter Assembly Spread pins in readout module
Readout loks in displaying 64444 or 39999	Faulty Comparator Assembly Plug-in drawers not fully closed
Excessive noise	Spring contact on Power Supply Assembly not in contact with outer chassis. Guard lead not connected to signal low. Shield missing from Function Relay Assembly, Filter Assembly, Buffer Assembly, Reference Assembly or Comparator Assembly. Round pin on power cord (green wire) not connected to earth ground.
No major transfer of digits	Faulty Regulator Assembly
No digits displayed except numberal "1" in over-range readout	Failure of Regulator Assembly
Readout locks in displaying 119999	Faulty Decade Counter Assembly Faulty Threshold & Clock Assembly Faulty Program Counter Assembly
Absence of polarity symbol in DC or MV mode	Lamp bulb failure Faulty Range Decision Assembly
Decimals flashing	Faulty 5th Decade Assembly
Instrument will not scan	Faulty Decade Counter Faulty Threshold & Clock Assembly Faulty Program Counter Assembly
No Readout Oscillates between ranges	Faulty Buffer Board
Will not transfer decimals	Needs calibration Faulty 5th Decade Assembly

Table II. Troubleshooting (Con't)

TROUBLE	PROBABLE CAUSE
Threshold control inactive	Faulty Threshold & Clock Assembly
Offset plus control inactive	Faulty Buffer Assebmly Faulty Comparator Assembly
Offset minus control inactive	Faulty Comparator Assembly Faulty Inverter Assembly
Excessive "0" drift	If (-), faulty Inverter Assembly If (+), faulty Buffer Assembly
Excessive calibration drift	Faulty Reference Assembly
Will not change polarity	Faulty Inverter Assebmly Faulty Polarity FF & Logic Assembly
Linearity errors Holds at transfer points	Contaminated 5th Decade Assembly
No Common-Mode-Rejection	Inner and outer chassis in contact Faulty input cable
Bits in Printout missing	Faulty Transfer Board No. 1 Assembly Faulty Transfer Board No. 2 Assembly Faulty Decode Assembly
No print pulse	Faulty Polarity FF & Logic Assembly Faulty Scan Counter Assembly
Remote control failure	Faulty Transfer Board No. 3 Assembly
No single scan	Faulty Scan Control Assembly
Lack of over-range indication	Faulty 5th Decade Assembly Faulty Range Decision Assembly
Two decimals in readout	Faulty Decode Assembly
Incorrect readings	Faulty Decode Assembly, Decade Assembly, Regulator Assembly
Reads 000000 in 1000V range	Faulty Program Counter Assembly

Table II. Troubleshooting (Con't)

TROUBLE	PROBABLE CAUSE
Improper reading in Ratio mode	Reference voltage exceeds -10V ±5%
Readings in improper range	Faulty Range Limit Logic Assembly
No decimal or all decimals in readout	Faulty Decode Assembly Faulty Polarity FF & Logic Assembly Faulty Range Counter Assembly
No "zero" in accessory modes	Faulty amplifier on accessor board If MV mode, lack of ±16V on Pre-amp
No reading in ohms mode	Bad fuse on ohms board Faulty amplifier on ohms board
Excessive noise in accessory modes	Faulty amplifier on accessory board
High Frequency breakdown or no reading in AC mode	Faulty Function Relay Assembly Faulty amplifier on AC Board
No reading in an accessory mode	Faulty Function Switching Assembly

LUBRICATION OF DRAWER ASSEMBLY CONNECTORS

Periodic lubrication of the drawer assembly connectors is not necessarily recommended, however, at any time the connectors appear difficult to separate or join together, a lubricant should be applied. The lubricant recommended is Cramolin Spray 3S, manufactured by Caig Laboratories, 46 Stanwood Road, New Hyde Park, New York 11040. The solution is equally effective as a general cleaner, moisture repellent and dielectric insulator. For convenience of application, the lubricant is packaged in a spray can with a whirl spray head and 6-inch extension tube.

APPLICATION

1. Remove drawer assemblies from outer chassis of the instrument. Refer to paragraph entitled Calibration with Drawers Removed in Chapter III for instructions on drawer removal.
2. Remove outer cap from the spray can.
3. Remove spray head installed on can.
4. Install whirl spray head with 6-inch extension tube.

WARNING

Cramolin Spray 3S is flammable; do not spray against open flame.

5. Very sparingly spray solution on each male and female contact point of the twelve connectors which join the three drawer assemblies together.
6. Wipe off any excess solution and ensure that lint or other foreign matter does not adhere to any portion of the connectors.
7. Reassemble drawer assemblies into outer chassis.

CHAPTER V

PARTS LIST

This chapter provides a list of electrical and electronic parts for the Series X-1 Digital Voltmeter. The parts are called out on photographs and are listed by circuit reference. Manufacturers of all components called out in the parts list are referred to by their Manufacturer's five-digit code number. Manufacturers and their codes are as follows:

Code	Manufacturer
00779	Amp, Inc. P. O. Box 3608 Harrisburg, PA
01121	Allen Bradley Co. 1201 South Second Street Milwaukee, WI
01295	Texas Instruments, Inc. Transistor Products Division Dallas, TX
02660	Amphenal-Borg Electronics Corp. 25th & Cermah Road Maywood, IL
02799	Arco Capacitors, Inc. 1548 South Robertson Los Angeles, CA
03296	Nylon Molding Corp. Garwood, NY
03626	Non-Linear Systems, Inc. P. O. Box N Del Mar, CA
03888	Pyrofilm Resistor Co. Morristown, NJ
04009	Arrow-Hart & Hegeman Electric Co. Hartford, CT
04062	Elmenco Products Co. New York, NY
04713	Motorola, Inc. Semiconductor Products Division 5005 East McDowell Road Phoenix, AZ
05574	Viking Industries, Inc. 21343 Roscoe Boulevard Conoga Park, CA
05820	Wakefield Engineering, Inc. 139 Foundry Street Wakefield, MA
07047	The Ross Milton Co. 511 Second Street Pike Southampton, Pa
07213	Aviation Electronics LTD Montreal Quebec, Canada
07263	Fairchild Camera & Instrument Corp. Semiconductor Division 313 Bayshore Frontage Road Mountain View, CA
07910	Continental Device Corp. 12515 Charden Hawthorne, CA
08261	Spectra-Strope Wire & Cable Corp. 10052 Larson Avenue Garden Grove, CA

Code	Manufacturer
08621	Swivelier Co., Inc. Manuet, NY
09635	Mohawk Wire & Cable Corp. Fitchburg, MA
12406	Elpac, Inc. 4270 Artesia Fullerton, CA
13656	48 Toledo Street Farmingdale, NY
14752	Electro Cube, Inc. 805 Fairway South Pasadena, CA
15558	Micon Electronics, Inc. Zeckendorf Boulevard Garden City, Long Island, NY
15653	Kaynar Manufacturing Co., Inc. Kaylock Division P.O. Box 3001 Fullerton, CA
16299	Corning Glass Works Electronics Components Division 3900 Electronics Drive Raleigh, NC
17065	Minni-Mold, Inc. 14759 Bessemer Van Nuys, CA
18641	Sencor Hato Rey Puerto Rico

Code	Manufacturer
20598	Tech Products 105 Willow Avenue Staten Island, NY
23480	Control Knob Corp. Jamaica, NY
28520	Heyman Manufacturing Co. 147 North Michigan Avenue Kenilworth, NY
35009	I R C Resistor Division of Renfrew Co., LTD Toronto, Ontario, Canada
44655	Ohmite Manufacturing Co. Chicago IL
53021	Sangamo Electric Co. 1301 North 11th Springfield, IL
70903	Belden Manufacturing Co. 415 South Kilpatrick Chicago, IL
71590	Centralab Division of Globe-Union, Inc. 932 East Keife Avenue Milwaukee, WI
72653	General Cement Division of Textron, Inc. Rockford, IL
73138	Helipot Division of Beckman Instruments, Inc. 2500 Harbor Boulevard Fullerton, CA

Code	Manufacturer
73445	Amperex Electronics Co., Division of North American Philips Co., Inc.
73559	Carling Electric, Inc. Hartford, CT
73899	J F D Electronics Corp. 15th at 62nd Street Brooklyn, NY
75042	International Resistance Co. 401 North Broad Philadelphia, PA
75402	Kramer Auto Radiator Corp. New York, NY
75915	Littlefuse, Inc. 800 East Northwest Highway Des Plaines, IL
77342	American Machine & Foundry Co. Potter & Brunfield Division Road 64 East Princeton, IN
79963	Zierick Manufacturing Corp. 83 Rockdale Avenue New Rochelle, NY
80053	Panoramic Radio Products, Inc. Mt. Vernon, NY
80183	Sprague Products North Adams, MA
80294	Bourns, Inc. 6135 Magnolia Avenue Riverside, CA
82877	Rotron Manufacturing Co., Inc. 7-9 Hasbrouch Lane Woodstock, NY
83330	Smith Herman H., Inc. 2334 Nostrand Avenue Booklyn, NY
91418	Radio Materials Co. 2442 West Bryon Mawr Chicago, IL
91662	Elco Corp. Philadelphia, PA
94222	South Chester Corp. Chester, PA
95264	Lerco Electronics, Inc. Burbank, CA
98159	Rubber Teck, Inc. P.O. Box 389 Gardena, CA
98978	International Electronic Research Corp. Burbank, CA
99779	Barnes Development Co. 213 West Baltimore Pike Lansdowne, PA

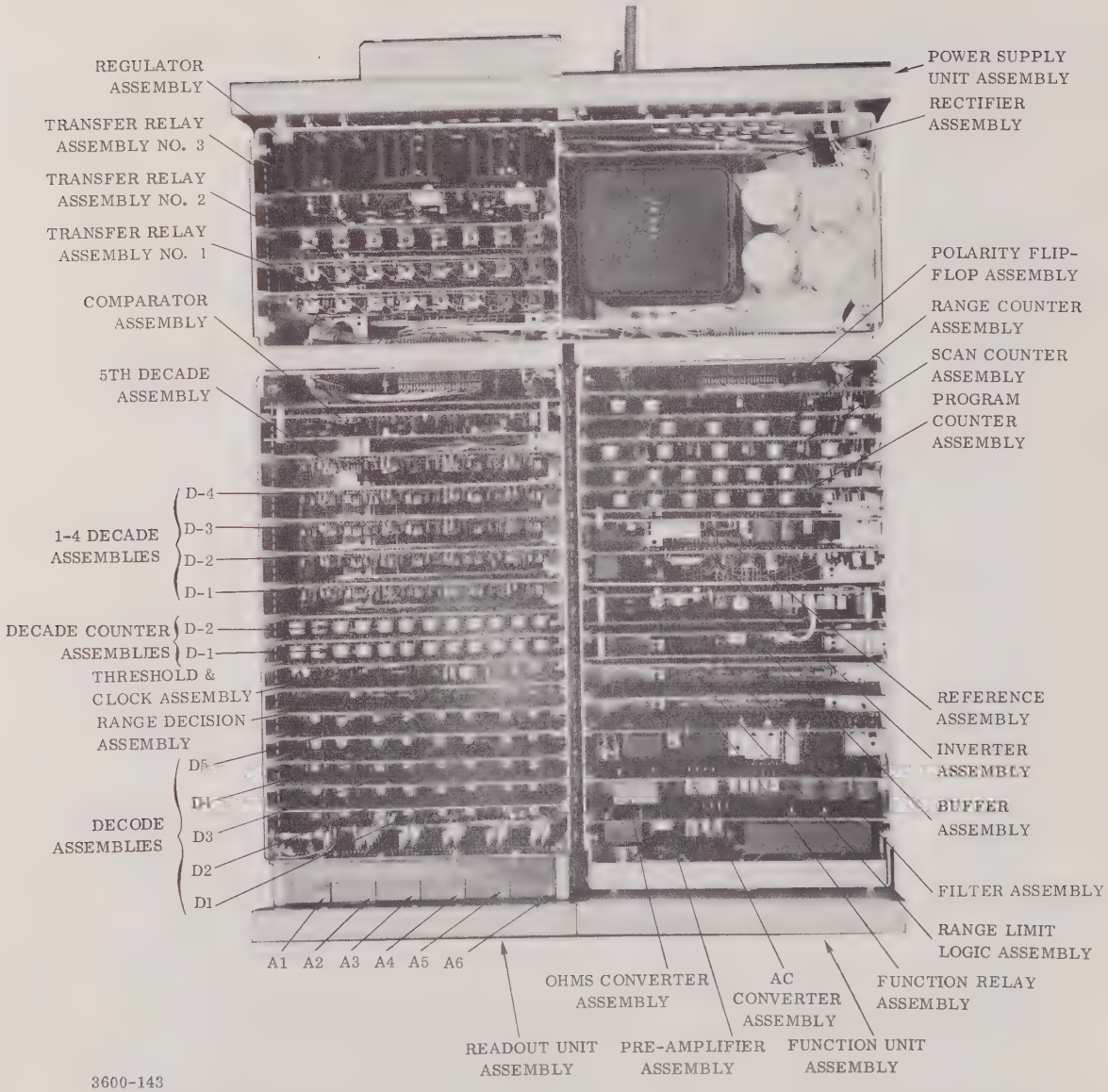


Figure 5-1. DVM Assembly

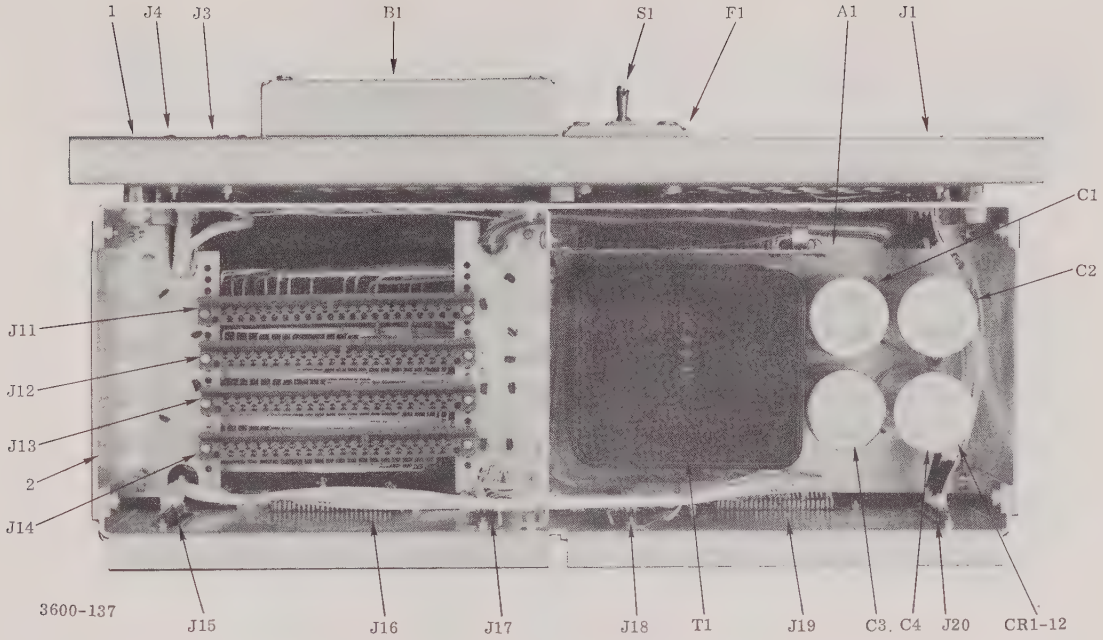


Figure 5-3. Power Supply Unit Assembly

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Power Supply	36-470	Power Supply Unit Assembly		
1	36-477	S/A Rear Drawer	1	03626
A1	36-495	Rectifier Assembly	1	03626
B1	Whisper	Fan	1	82877
C1 & C2	500-105-01	Capacitor, 1900μF, 50V	2	53021
C3	500-1034-01	Capacitor, 6000μF, 20V	1	53021
C4	500-1074-01	Capacitor, 725μF, 100V	1	53021
CR1-12	1N4003	Diode	12	01295
F1	313001	Fuse, 3A6, 1A, SLO-BLO	1	75915
J1, J2 & J3	57-40500	Receptacle	3	02660
J11-14	00-7024-041-141-500	Connector	4	91662
J15-20	57-20500-6	Connector	6	02660
S1	213-73	Switch, DPST	1	73559
T1	D-231	Transformer	1	03626

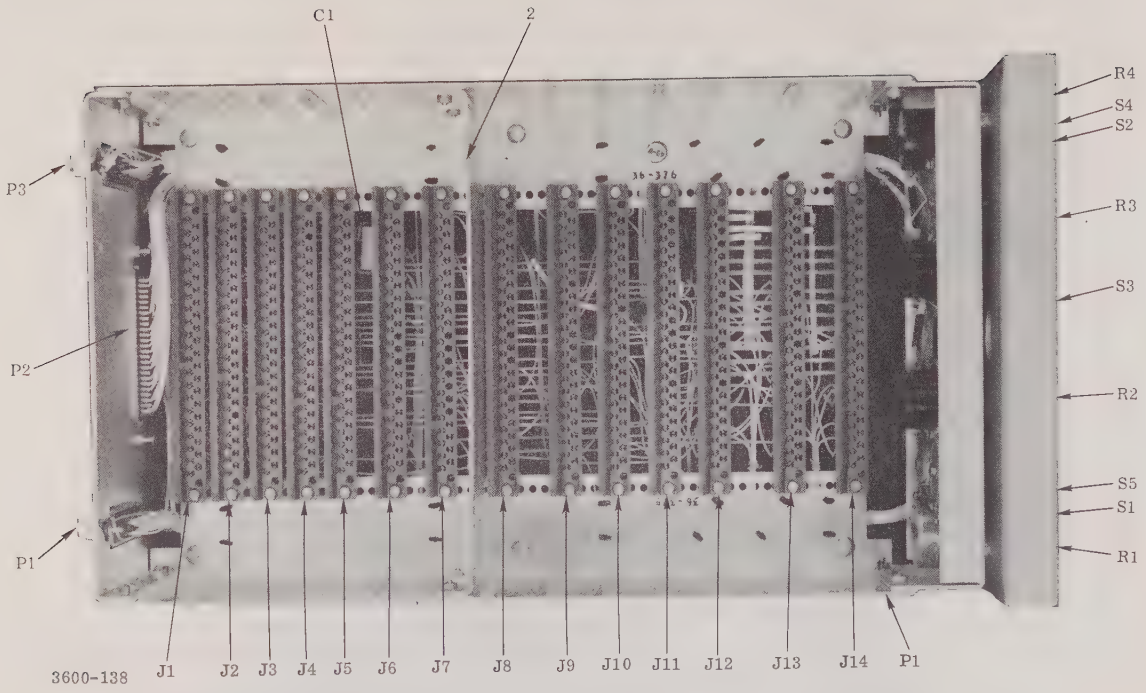


Figure 5-4. Function Unit Assembly

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Function Unit	36-655	Function Unit Assembly		
1	36-372	S/A, Right Drawer	1	03626
C1	C28-1AB/A220K	Capacitor, 22μF, 250V	1	73445
J1-14	00-7024-041-280-001	Connector	14	91662
P1-3	57-10500-6	Connector	3	02660
R1	36-500	Potentiometer	1	03626
R2-4	36-499	Potentiometer	3	03626
S1-3 & S5	36-158	Switch	4	03626
S4	36-175	Switch	1	03626

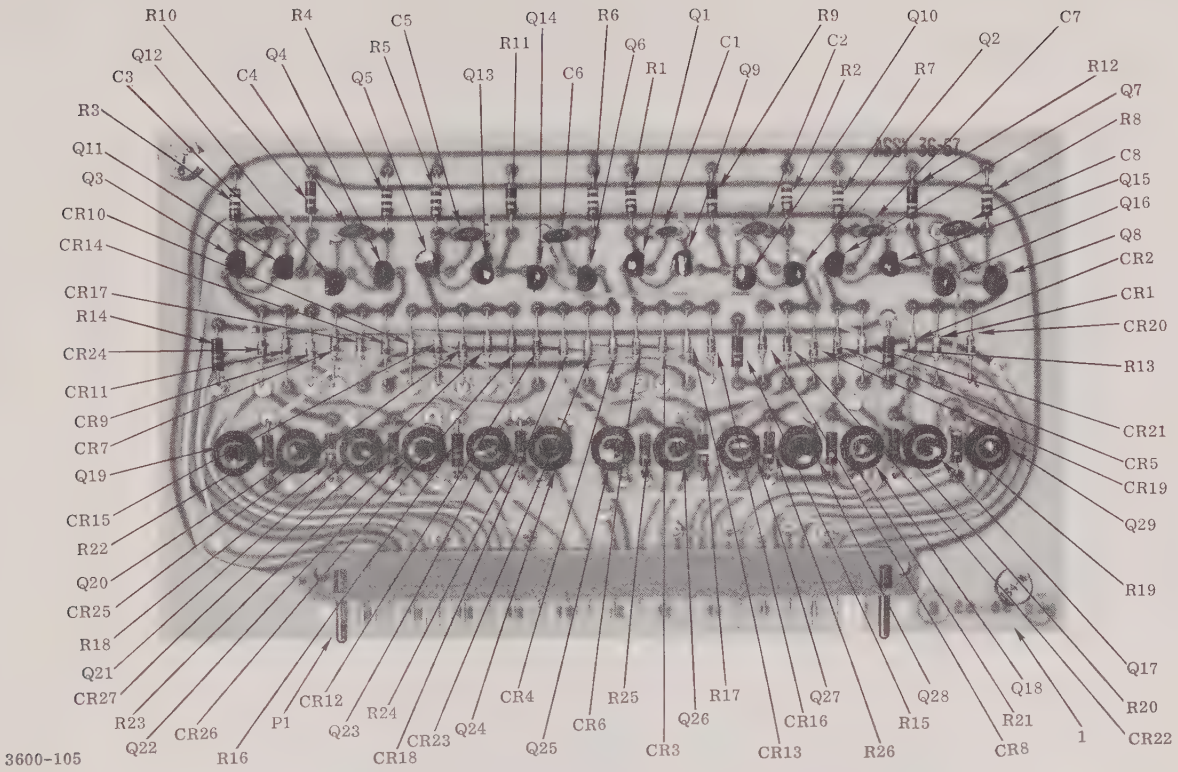


Figure 5-5. Decode Assembly, 36-67

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Decode Assy	36-67	Assy, Decode		
1	36-66	PC S/A Decode	1	03626
P1	00-7023-041-000-001	Connector	1	91662
C1-8	5002-009	Cap, 220 PF, 500V	8	91418
CR1-27	5003-002	Diode	27	03626
Q1-8	2N3906/2N3638A/2N3702	Transistor	8	04713
Q9-16	SK6S01/2N3643	Transistor	8	04713
Q17-29	2N3638A/2N3644	Transistor	13	07263
R1-8	RC07GF393J	Res, 1/4W, 39K, 5%	8	01121
R9-12	RC07GF103J	Res, 1/4W, 10K, 5%	4	01121
R13-16	RC07GF203J	Res, 1/4W, 20K, 5%	4	01121
R17-18	RC07GF104J	Res, 1/4W, 100K, 5%	2	01121
R19	RC07GF302J	Res, 1/4W, 3K, 5%	1	01121
R20-26	RC07GF302J	Res, 1/4W, 5.1K, 5%	6	01121

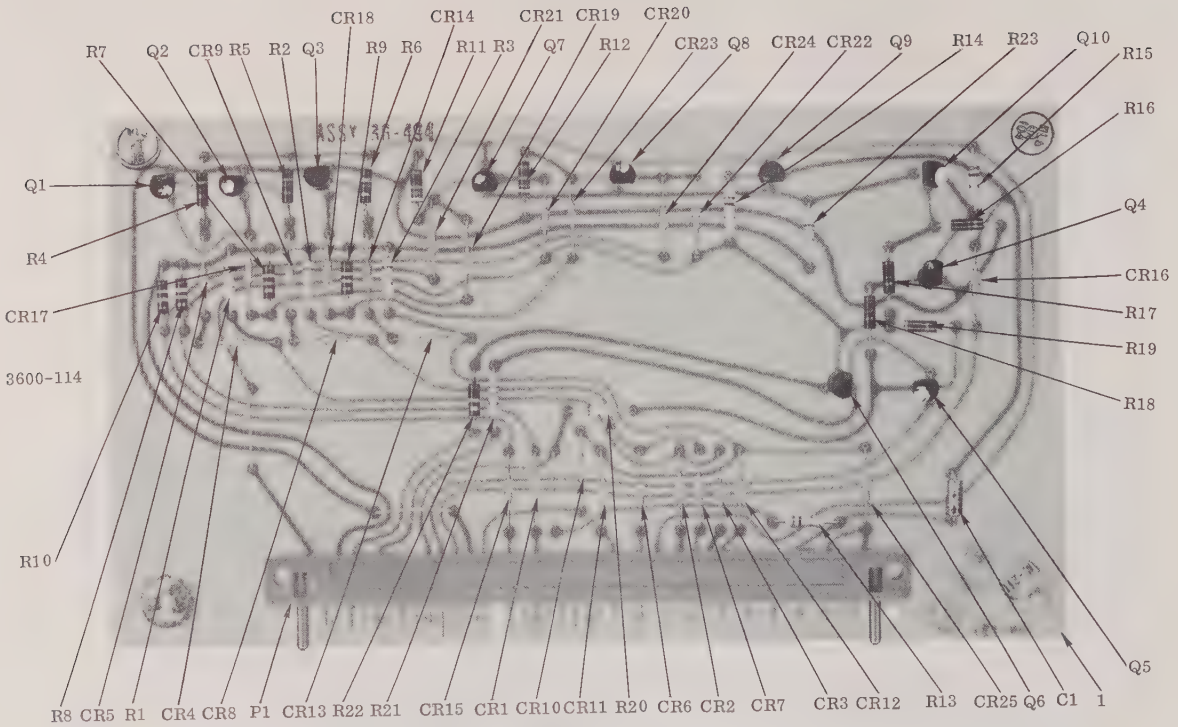


Figure 5-6. Scan Control Assembly, 36-494

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Scan Control	36-494	Assy, Scan Control		
1	36-493	PC S/A, Scan Control	1	03626
P1	00-7023-041-000-001	Connector	1	91662
C1	BT1	Cap, 1 MF, 35V	1	91418
CR1-25	5003-002	Diode	25	03626
Q1-6	2N3906	Transistor	6	03626
Q1-6	2N3638A/2N3702*	Transistor	6	03626
Q7-10	2N3904	Transistor	4	03626
Q7-10	2N3965/2N3711*	Transistor	4	03626
R1-3	RC07GF133J	Res, 1/4W, 13K, 5%	3	01121
R4-6	RC07GF682J	Res, 1/4W, 6.8, 5%	3	01121
R7-10	RC07GF243J	Res, 1/4W, 24K, 5%	4	01121
R11-12	RC07GF203J	Res, 1/4W, 20K, 5%	2	01121
R13-15	RC07GF104J	Res, 1/4W, 100K, 5%	3	01121
R16-18	RC07GF202J	Res, 1/4W, 2K, 5%	3	01121
R19	RC07GF302J	Res, 1/4W, 3K, 5%	1	01121
R21	RC07GF363J	Res, 1/4W, 36K, 5%	1	01121
R22	RC07GF622J	Res, 1/4W, 6.2K, 5%	1	01121
R23	RC07GF103J	Res, 1/4W, 10K, 5%	1	01121
	RC07GF123J	Res, 1/4W, 12K, 5%	1	01121

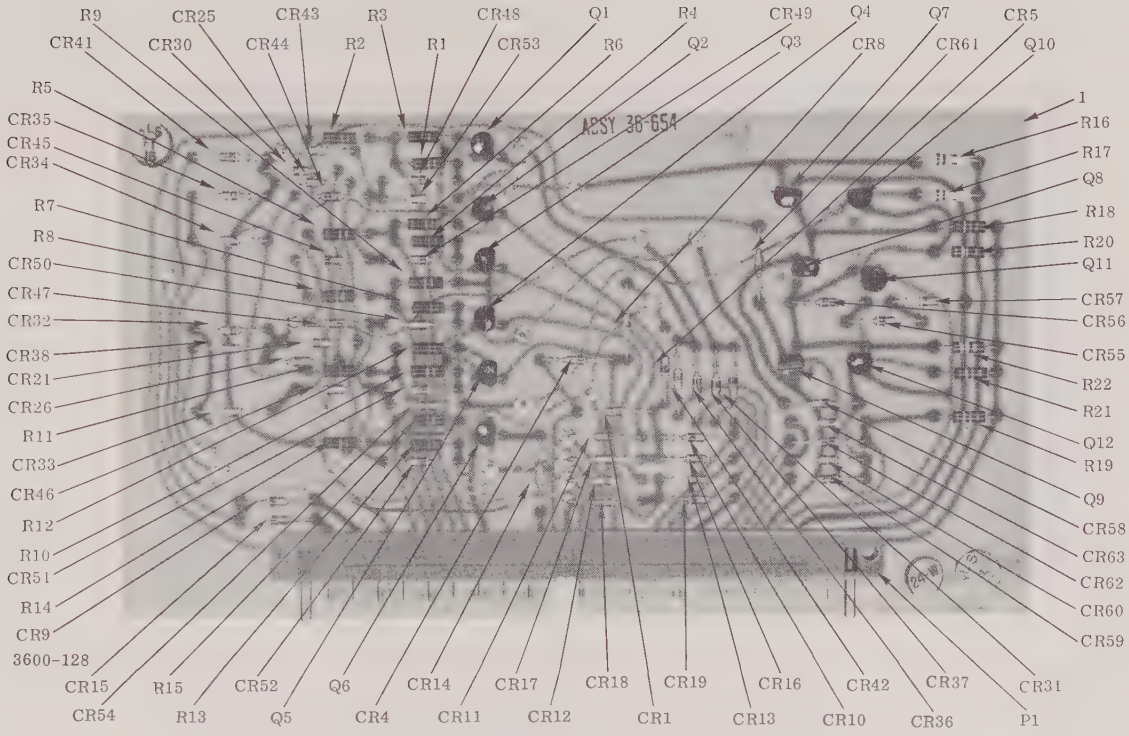


Figure 5-7. Range Limit Logic Assembly, 36-654

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Range Limit Logic	36-654	Assy, Range Limit Logic		
1	36-653	PC S/A, Range Limit	1	03626
P1	00-7023-41-000-001	Connector	1	91662
CR1	5003-002	Diode	1	03626
CR4-5	5003-002	Diode	2	03626
CR8-19	5003-002	Diode	12	03626
CR21	5003-002	Diode	1	03626
CR25-26	5003-002	Diode	2	03626
CR30-38	5003-002	Diode	9	03626
CR41-63	5003-002	Diode	23	03626
Q1-12	2N3906 2N3638A 2N3702	Transistor, PNP	12	07263
R1-15	RC07GF103J	Res, 1/4W, 10K, 5%	15	03626
R16-17	RC07GF104J	Res, 1/4W, 100K, 5%	2	03626
R18-21	RC07GF243J	Res, 1/4W, 24K, 5%	4	03626
R22	RC07GF133J	Res, 1/4W, 13K, 5%	1	03626

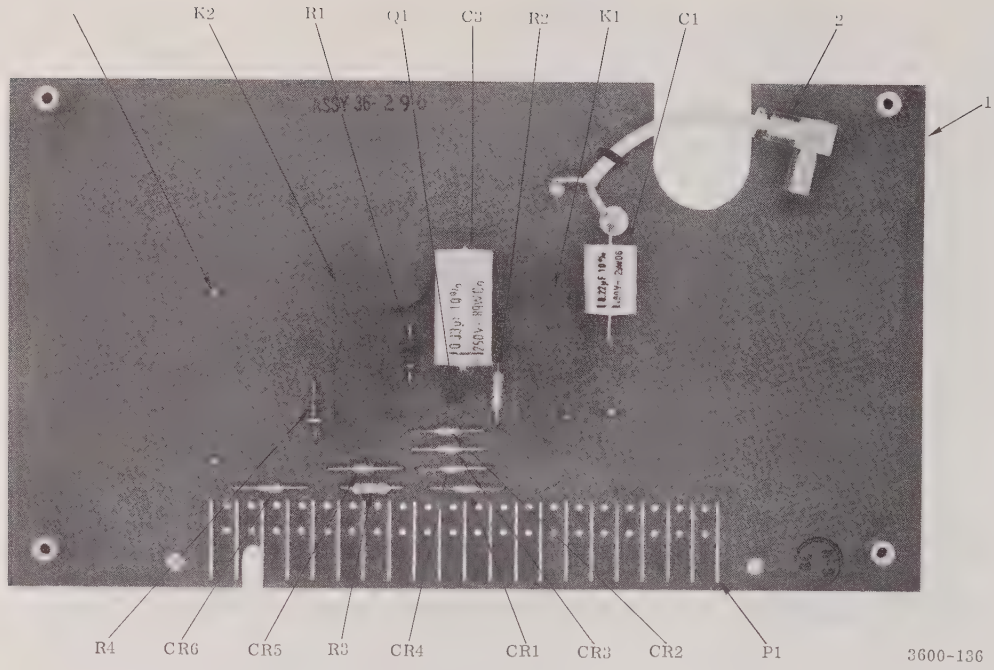


Figure 5-8. Filter Assembly, 36-296

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Filter	36-296	Assy, Filter		
1	36-295	PC S/A, Filter	1	03626
2	1127/188	Connector	1	15558
3	RG188/AG	Cable, 2-1/2"	1	70903
4	36-192	Shield	1	03626
5	2000-20	Standoff, 3/16" dia.	4	03626
P1	00-7023-041-000-001	Connector	1	91662
C1	C281CH/B22K	Cap, .22 MF, 100V, 5%	1	73445
C2	STA736-1	Cap, 18 MF, 35V, 10%	1	12406
C3	C281AB/A330K	Cap, .33 MF, 200V, 10%	1	73445
CR1-6	5003-002	Diode	6	03626
K1-2	5-27-2	Relay	2	03626
Q1	SK6501	Transistor	1	01295
R1	RC07GF105J	Res, 1/4W, 1M, 5%	1	01121
R2	RC07GF243J	Res, 1/4W, 24K, 5%	1	01121
R3	RF07GF133J	Res, 1/4W, 13K, 5%	1	01121
R4	RL07S301G	1/4W, 300 ohm, 2%	1	75402

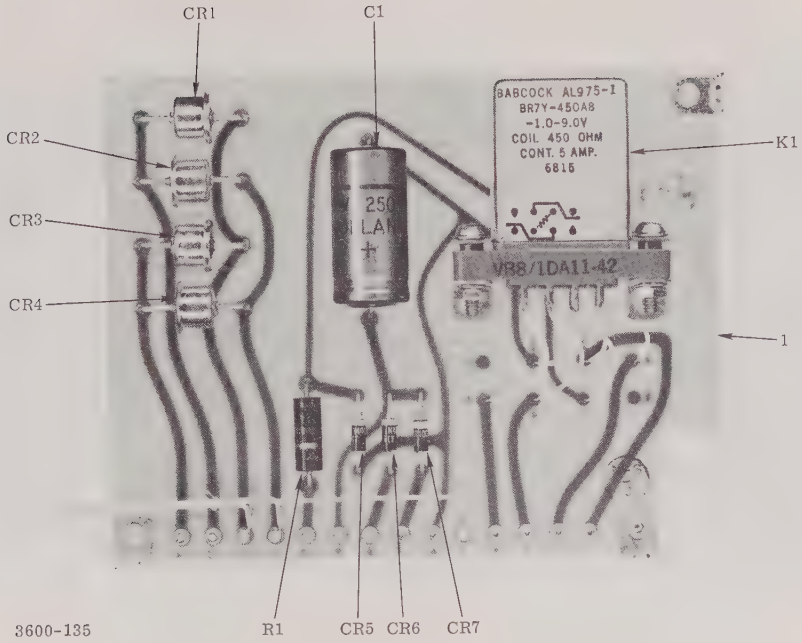


Figure 5-9. Rectifier & Power Relay Assembly, 36-485 & Rectifier Assembly, 36-495

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Rect-Pwr	36-485	Rectifier & Power Relay Assembly		03626
1	36-484	P. C. S/A Rectifier-Power	1	03626
P1	VB8/10A11-42	Connector	1	05574
C1	C437AR/G250	Cap, 250uf, 40V	1	73445
CR1-4	1N4720	Diode	4	01295
CR5-7	1N4003	Diode	3	01295
K1	BR7Y-450A8	Relay	1	09026
R1	Com'l	Resistor 150 OHM, 1W 5%	1	01121
Rect	36-495	Rectifier Assembly		03626
1	36-494	P. C. S/A Rectifier	1	03626
CR1-4	1N4720	Diode	4	01295

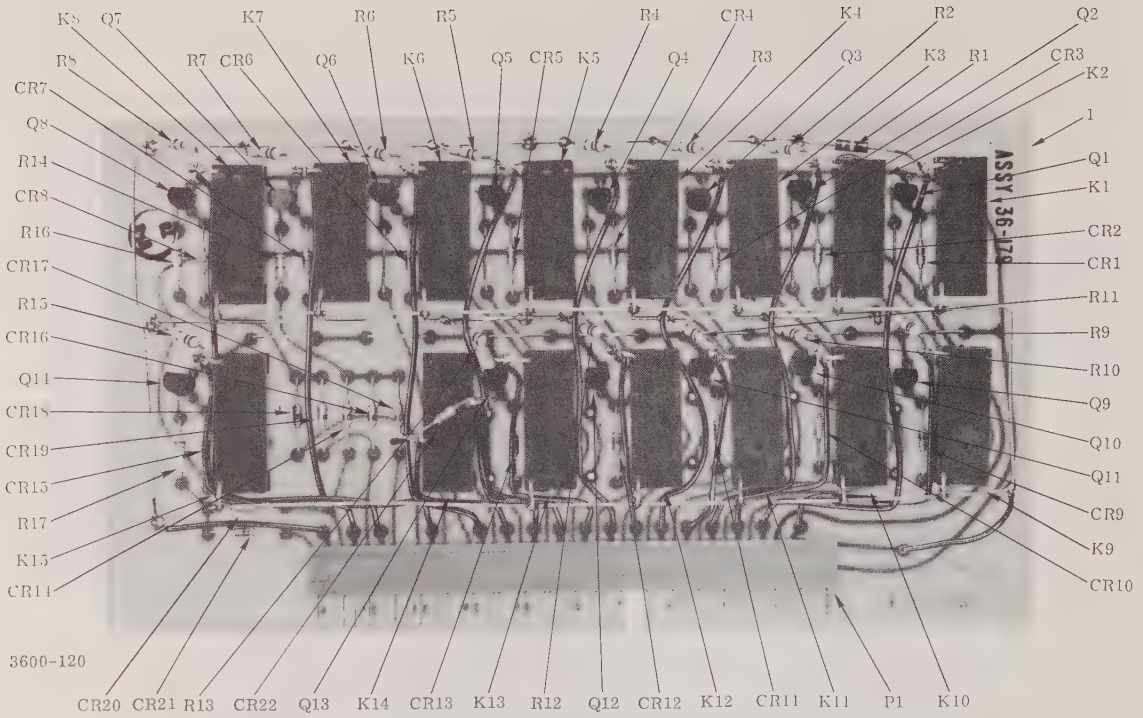


Figure 5-10. Transfer Board No. 1 Assembly, 36-179

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Transfer Bd	36-179	Assy, Transfer Board No. 1		
1	36-178	PC S/A, Transfer Bd No. 1	1	03626
P1	00-7023-041-000-001	Connector	1	91662
CR1-22	5003-002	Diode	22	03626
Q1-14	2N3644	Transistor	14	07263
Q1-14	SK7431*	Transistor	14	07263
K1-15	5-12-27	Relay	15	03626
R1-13	RC07GF104J	Res, 1/4W, 100K, 5%	14	03626
R14	RC07GF123J	Res, 1/4W, 12K, 5%	1	03626
R15	RC07GF104J	Res, 1/4W, 100K, 5%	1	03626
R16-17	RC07GF123J	Res, 1/4W, 12K, 5%	2	03626

*Alternate

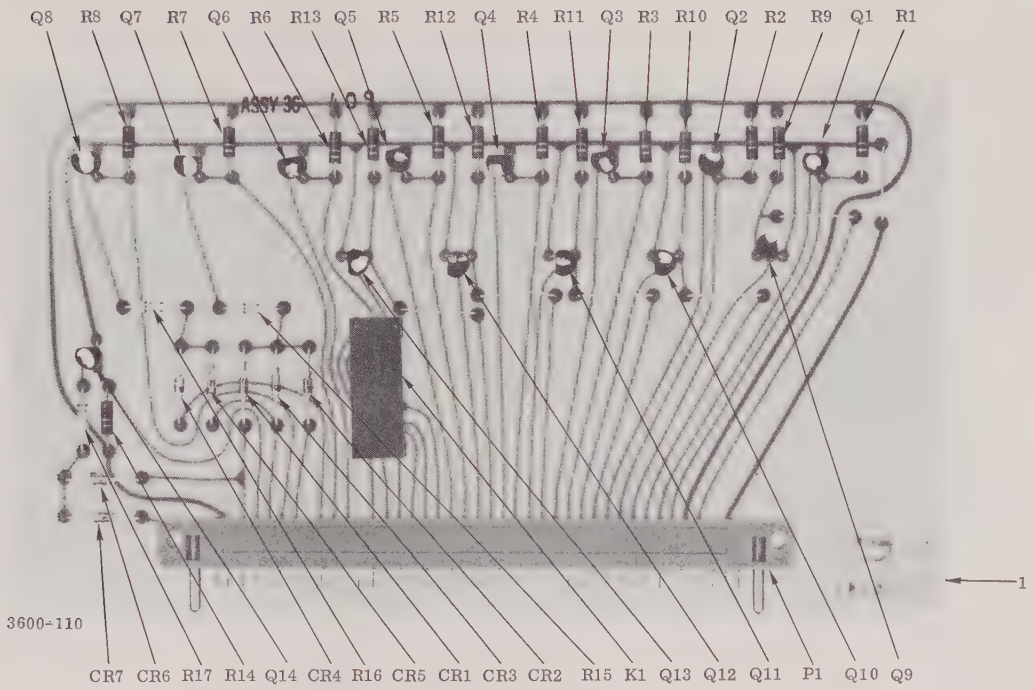


Figure 5-11. Transfer Board No. 1 Assembly, 36-409

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Transfer Bd. #1	36-409	Assy, Transfer Bd. No. 1		
1	36-432	PC S/A, Transfer Bd. 1	1	03626
P1	00-7023-041-000-001	Connector	1	91662
CR1-7	5003-002	Diode	7	03626
K1	5-12-2	Relay	1	03626
Q1-14	2N3644	Transistor	14	07263
Q1-14	SK7431*	Transistor	14	07263
R1-14	RC07GF103J	Res, 1/4W, 10K, 5%	14	01121
R15-17	RC07GF123J	Res, 1/4W, 12K, 5%	3	01121

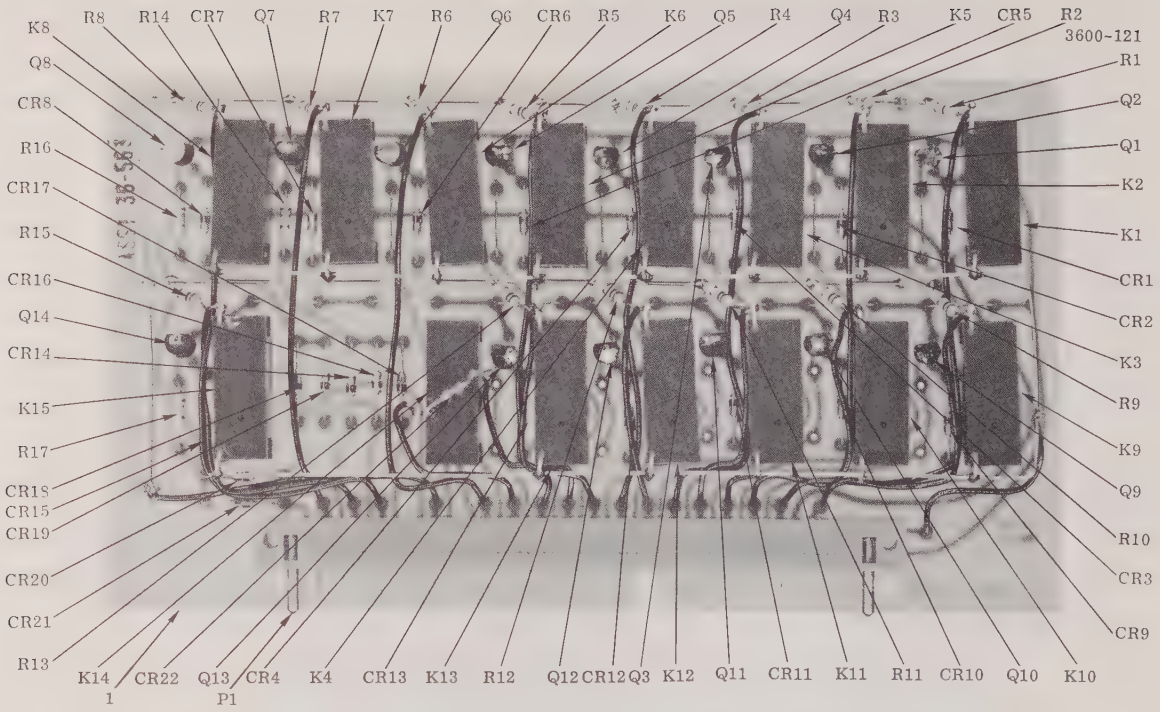


Figure 5-12. Transfer Board No. 1 Assembly, 36-563

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Tran No. 1	36-563	Assembly, Transfer Board No. 1		
	36-178	PC S/A, Trans No. 1	1	03626
J1	00-7023-041-000-001	Connector	1	91662
CR1-22	5003-002	Diode	22	03626
Q1-14	2N3644	Transistor	14	07263
Q1-14*	SK7431	Transistor	14	07263
K1-13 & K15	5-12-27	Relay	14	03626
K14	5-12-28	Relay	1	03626
R1-13	RC07GF104J	Res., 1/4W, 100K, 5%	14	03626
R14	RC07GF123J	Res., 1/4W, 12K, 5%	1	03626
R15	RC07GF104J	Res., 1/4W, 100K, 5%	1	03626
R16-17	RC07GF123J	Res., 1/4W, 12K, 5%	2	03626

*Alternate

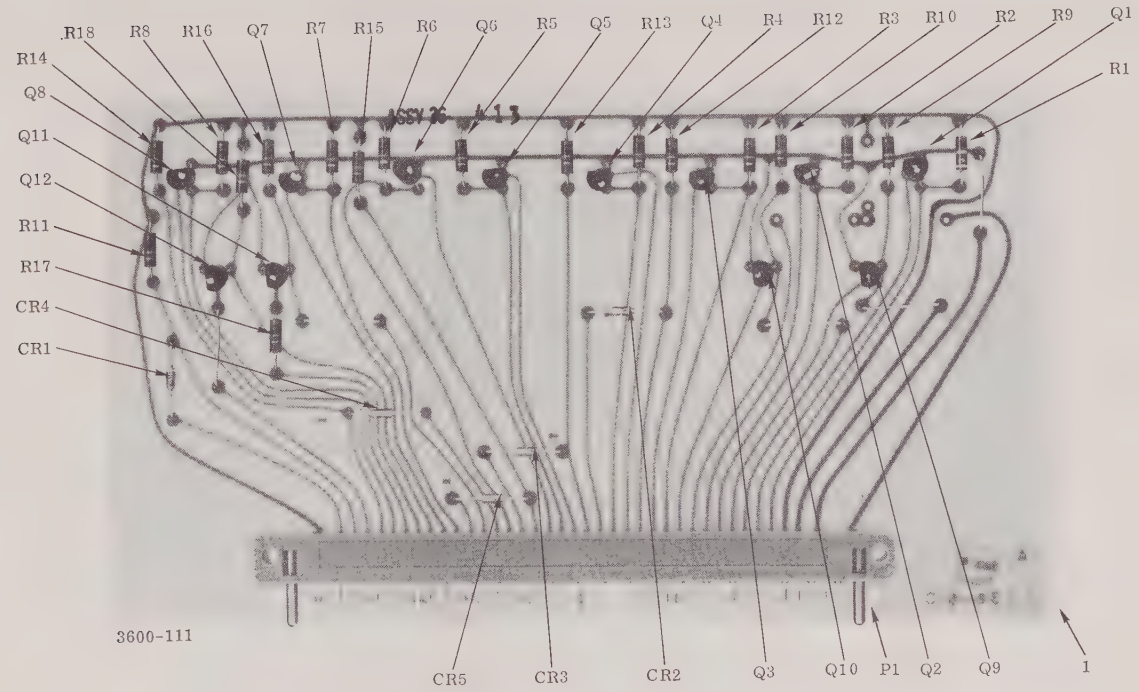


Figure 5-13. Transfer Board No. 2 Assembly, 36-413

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Transfer Bd. No. 2	36-413	Assy, Transfer Board No. 2		
1	36-611	PC S/A, Transfer Board No. 2	1	03626
2	00-7023-041-000-001	Connector	1	91662
Q1-12	2N3644	Transistor	12	07263
Q1-12	SK7431*	Transistor	12	07263
CR1-5	5003-002	Diode	5	03626
R1-18	RC07GF1035	Res, 1/4W, 10K, 5%	18	01121

*Alternate

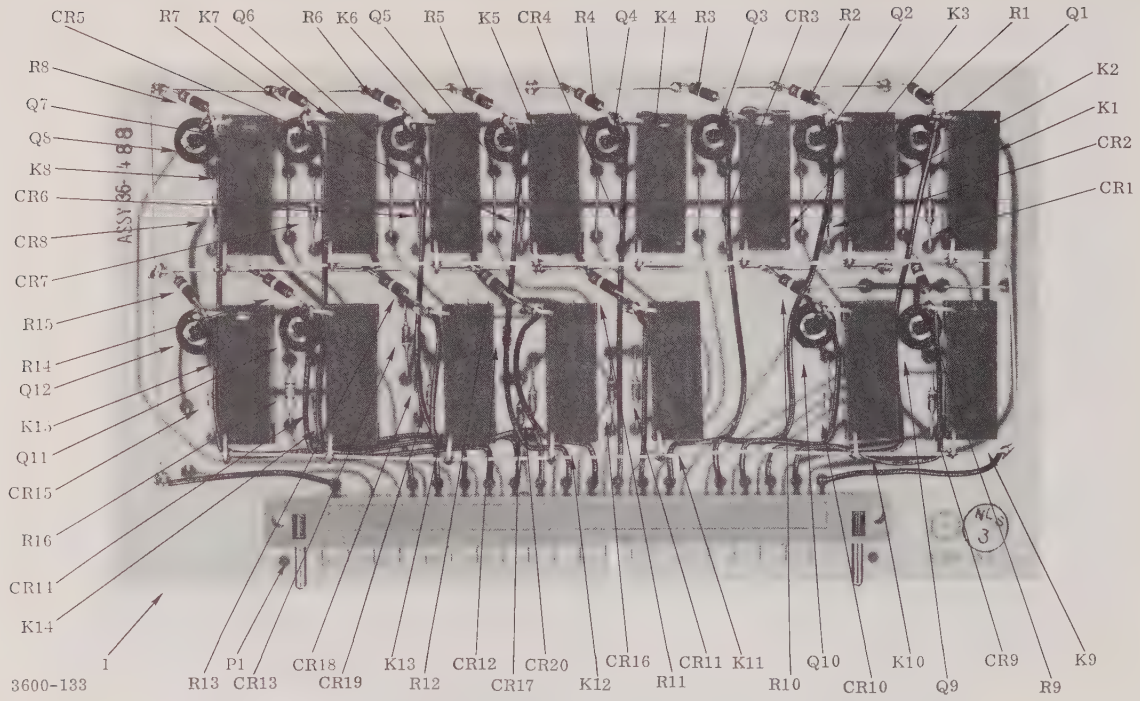


Figure 5-14. Transfer Board No. 2 Assembly, 36-488

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Transfer Bd. No. 2	36-488	Assy, Transfer Bd. No. 2		
1	36-487	PC S/A, Tran. No. 2	1	03626
P1	00-7023-041-000-001	Connector	1	91662
CR1-20	5003-002	Diode.	20	03626
K1-15	5-12-27	Relay	15	03626
Q1-12	2N3644 /SK7431*	Transistor	12	07263
R1-15	RC07GF104J	Res, 1/4W, 100K, 5%	15	03626
R16	RC07GF123J	Res, 1/4W, 12K, 5%	1	03626

*Alternate

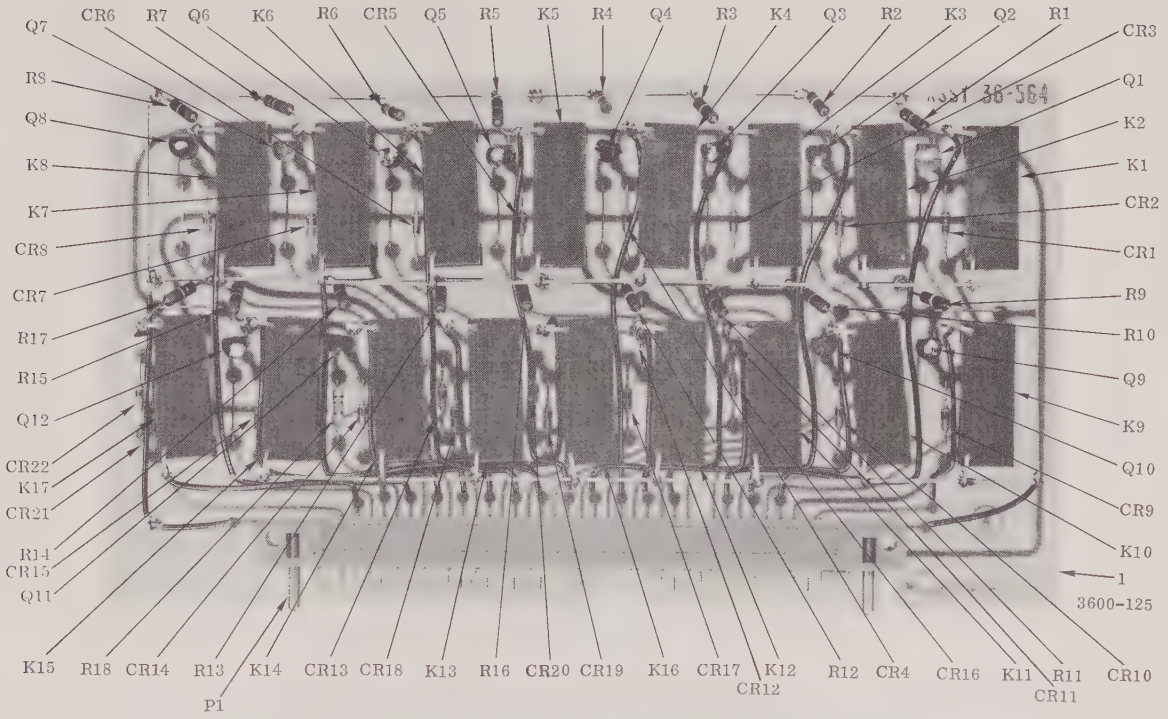


Figure 5-15. Transfer Board No. 2 Assembly, 36-564

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Tran No. 2	36-564	Transfer Board No. 2, Assembly		
1	36-466	PC S/A, Tran No. 2	1	03626
P1	00-7023-041-000-001	Connector	1	91662
CR1-22	5003-002	Diode	22	03626
K1-14, K16 & K17	5-12-28	Relay	16	03626
K15	5-12-27	Relay	1	03626
Q1-12	2N3644/SK7431*	Transistor	12	07263
R1-17	RC07GF104J	Res., 1/4W, 100K, 5%	17	01121
R18	RC07GF123J	Res., 1/4W, 12K, 5%	1	01121

*Alternate

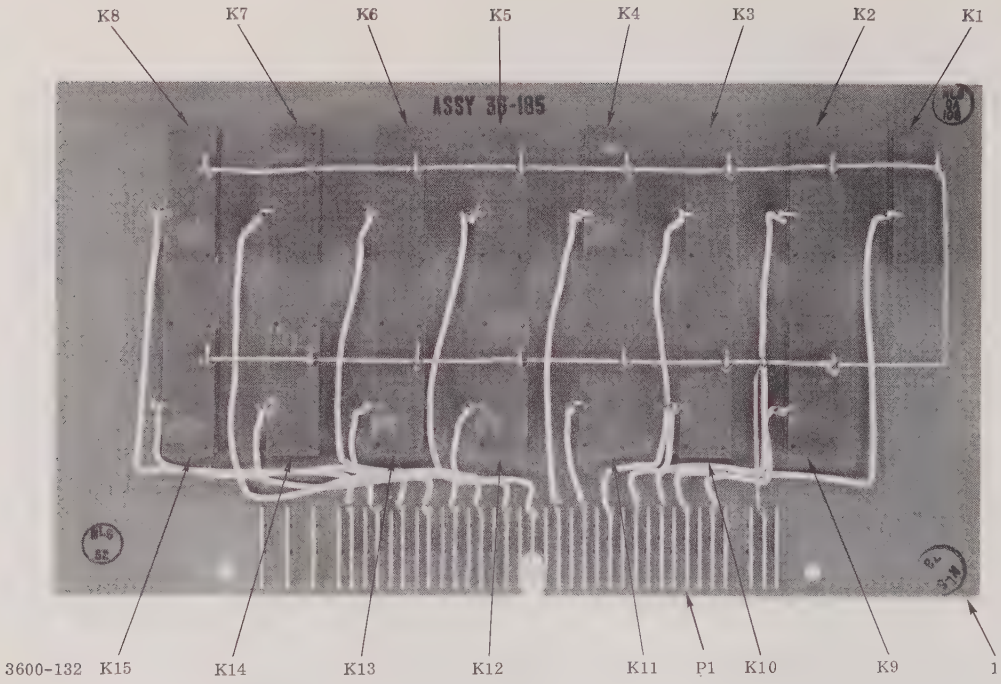


Figure 5-16. Transfer Board No. 3 Assembly, 36-185

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Tran No. 3	36-185	Transfer Board No. 3, Assembly		
1	36-184	PC S/A,Tran No. 3	1	03626
P1	00-7023-041-000-001	Connector	1	91662
K1-15	5-12-27	Relay	15	03626

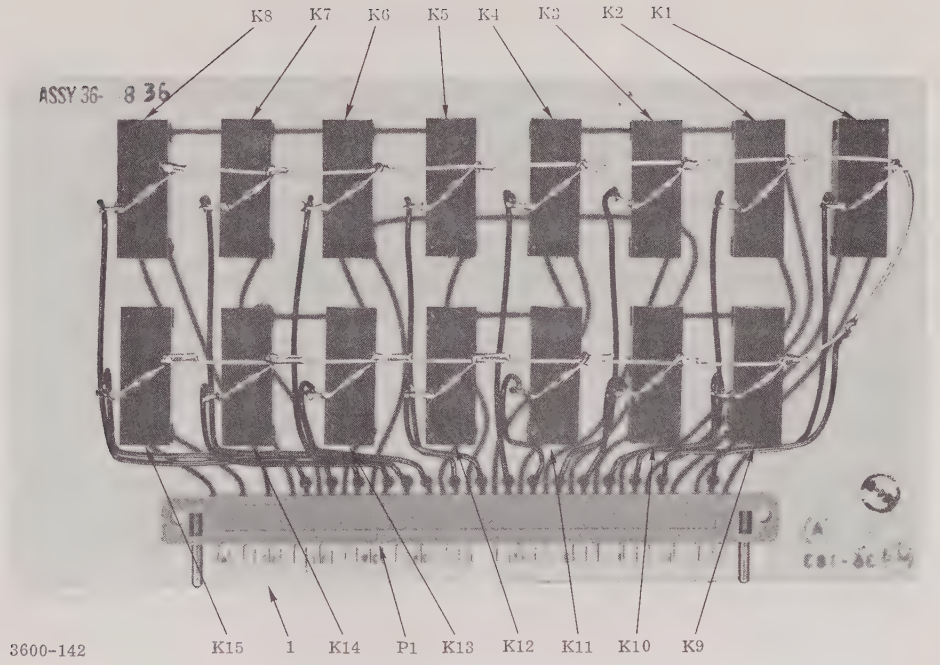


Figure 5-17. Transfer Board No. 3 Assembly, 36-836

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Tran No. 3	36-836	Transfer Board No. 3, Assembly		
1	36-184	PC S/A, Tran No. 3	1	03626
P1	00-7023-041-000-001	Connector	1	91662
CR1-15	5003-002	Diode	15	03626
K1-15	5-12-27	Relay	15	03626

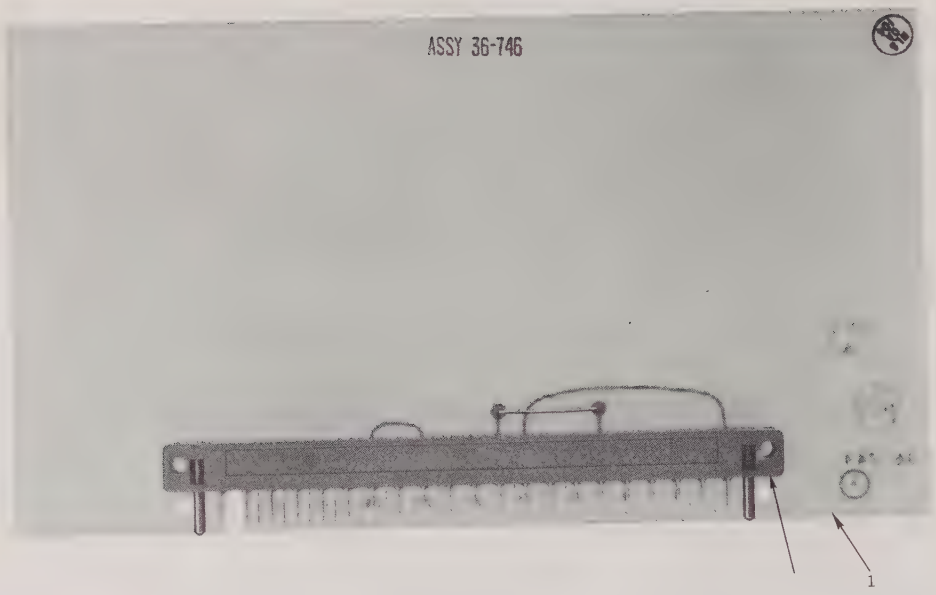


Figure 5-18. Jumper Board Assembly, 36-746

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Jumper Board	36-746	Jumper Board Assembly		
1	36-745	PC S/A, Jumper	1	03626
P1	00-7023-041-000-001	Connector	1	91662

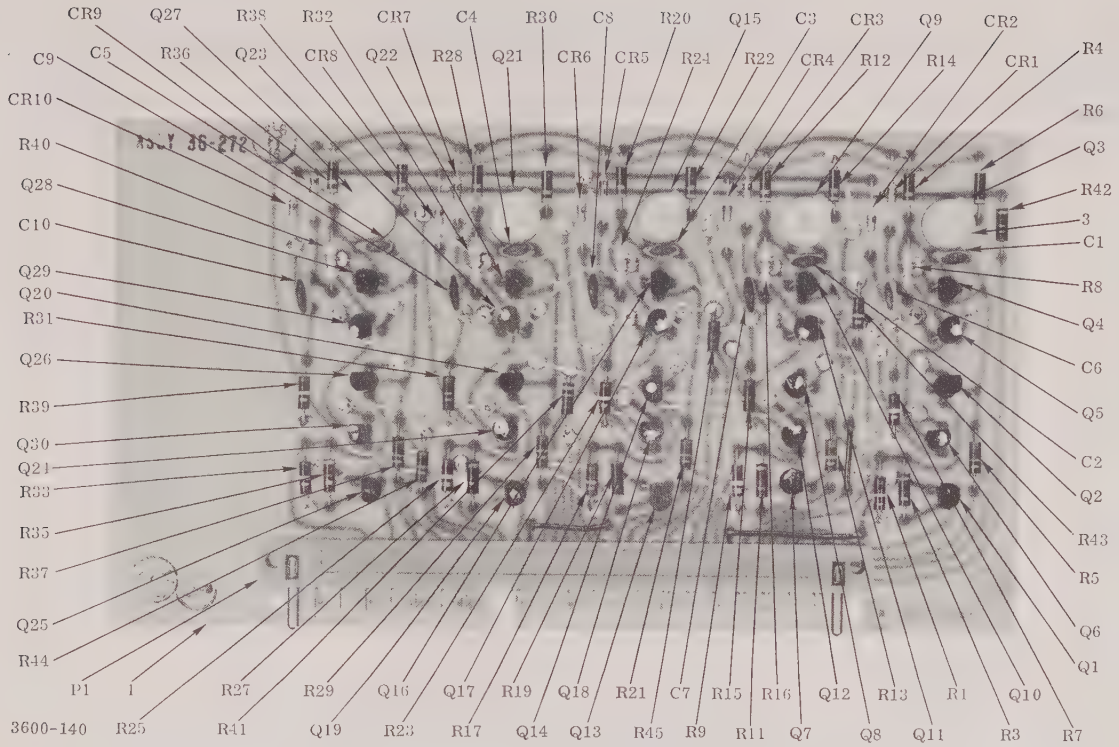


Figure 5-19. Range Counter Assembly, 36-272

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Range Ctr	36-272	Assy, Range Counter		
1	36-271	PC S/A, Range Ctr	1	03626
2	TO5	Cap, Plastic	5	03626
3	A10032	Transipad	5	07047
J2	00-7023-041 000-001	Connector	1	91662
C1-5	5002-009	Cap, 220 PF, 500V	5	91418
C6-10	5002-010	Cap. .002 MF, 500V	5	91418
CR1-10	5003-002	Diode	10	03626
Q1	2N3644/2N3906/ SK7431	Transistor	1	07263
Q2	2N3904/2N3565/ 2N3711	Transistor	1	04713
Q3	2N1305	Transistor	1	01295
Q4	2N3904/2N3565/ 2N3711	Transistor	1	04713
Q5-6	2N3906/2N3638A/ 2N3702	Transistor	2	04713
Q7	2N3644/2N3906/ SK7431	Transistor	1	07263

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q8	2N3904/2N3565/2N3711	Transistor	1	04713
Q9	2N1305	Transistor	11	01295
Q10	2N3904/2N3565/2N3711	Transistor	1	04713
Q11-12	2N3906/2N3638A/2N3702	Transistor	2	04713
Q13	2N3644/2N3906/SK7431	Transistor	1	07263
Q14	2N3904/2N3565/2N3711	Transistor	1	04713
Q15	2N1305	Transistor	1	01295
Q16	2N3904/2N3565/2N3711	Transistor	1	04713
Q17-18	2N3906/2N3638A/2N3702	Transistor	1	04713
Q19	2N3644/2N3906/SK7431	Transistor	1	07263
Q20	2N3904/2N3565/2N3711	Transistor	1	04713
Q21	2N1305	Transistor	1	01295
Q22	2N3904/2N3565/2N3711	Transistor	1	04713
Q23-24	2N3906/2N3638A/2N3702	Transistor	2	04713
Q25	2N3644/2N3906/SK7431	Transistor	1	07263
Q26	2N3904/2N3565/2N3711	Transistor	1	04713
Q27	2N1305	Transistor	1	01295
Q28	2N3904/2N3565/2N3711	Transistor	1	04713
Q29-30	2N3906/2N3638A/2N3702	Transistor	1	04713
R1	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R3	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R4	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R5	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R6	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R7	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R9	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R9	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R11	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R12	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R13	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R14	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R15	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R16	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R17	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R19	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R20	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R21	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R22	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R23	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R24	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R25	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R27	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R28	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R29	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R30	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R31	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R32	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R33	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R35	RC07GF302J	Res, 1/4W, 3K, 5%	1	

RANGE COUNTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
R36	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R37	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R38	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R39	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R40	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R41	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R42	RC07GF363J	Res, 1/4W, 36K, 5%	1	
R43	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R44-45	RC07GF103J	Res, 1/4W, 10K, 5%	1	

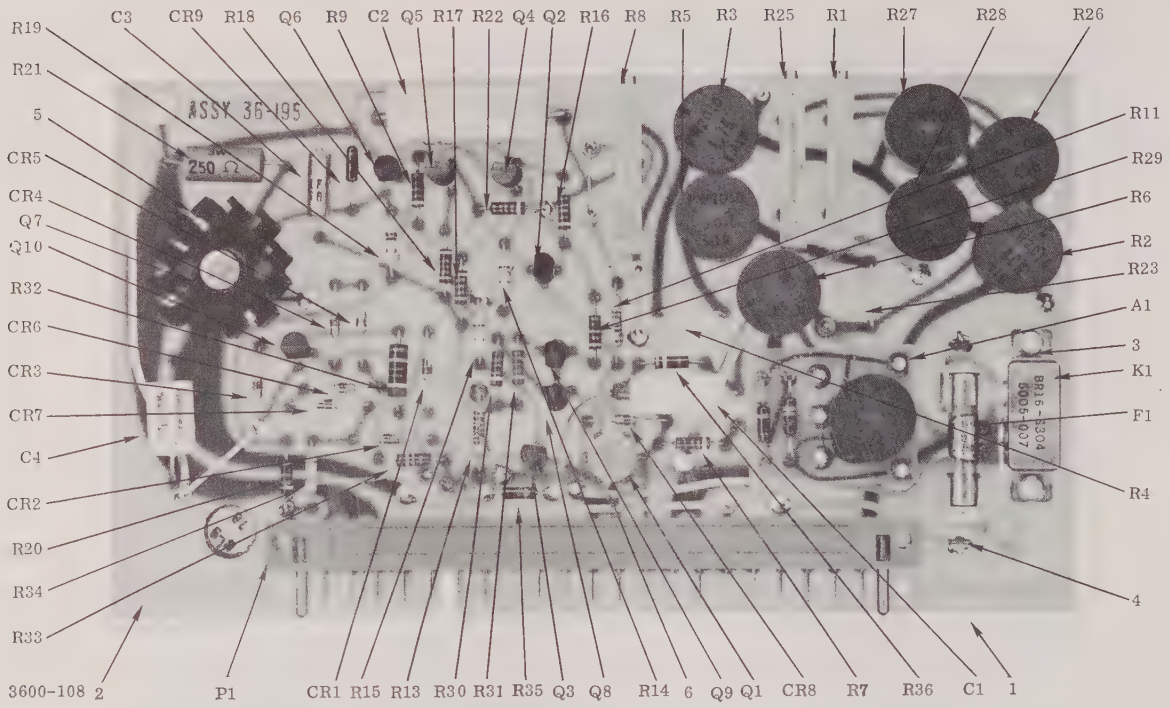


Figure 5-20. Ratio Reference Assembly, 36-195

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Ratio Ref	36-195	Assy, Ratio Ref		
1	36-194	PC S/A, Ratio Ref	1	03626
2	36-192	Shield	1	03626
3	2006-32	Spacer, 3/16 Lg	1	03626
4	121004	Clip, Fuse	1	75915
5	LP5A1B	Heat Sink	1	98978
P1	A10032	Transipad	1	07047
	00-7023-41-000-001	Connector	1	91662
A1	2-39	Assy, Zener	1	03626
C1	C281AB/A220K	Cap, .22 MF, 250V	1	73445
C2	C281AB/A1M	Cap, 1.0 UF, 250V, 10%	1	73445
C3	STA684-1	Cap, 5.6 MF, 35V	1	12406
C4	C281AB/A47K	Cap, .047 MF, 250V, 10%	1	73445
CR1-8	5003-002	Diode	8	03626
CR9	1N970B	Diode, Zener	1	04713
F1	361.031	Fuse, 1/32A, 8 AG	1	75915
K1	5005-007	Relay	1	03626

RATIO REFERENCE ASSEMBLY (continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q1	TP198A	Transistor	1	20598
Q2-3	2N3904	Transistor	2	01295
Q2-3	2N3565/2N3711*	Transistor	2	01295
Q4-5	2N4062/MPS6518	Transistor	2	04713
Q6	2N3904	Transistor	1	01295
Q6	2N3565/2N3711*	Transistor	1	01295
Q7	2N697	Transistor	1	07910
Q8-9	2N3707	Transistor	2	
Q10	SN6501	Transistor	1	
R1	78P-R2K	Pot, 2K	1	80053
R2	PW2016C40001S	Res, 40K, 1%	1	03626
R3	PW2016CFSVX	Res, FSV, 1, 2 or 3 ohm ±0.1 ohm	1	03626
R4	PW2016CFSVX	Res, FSV, 20, 40, 60, 80 ohm ±0.1 ohm	1	03626
R5	PW2016CFSVX	Res, FSV, 4, 8, 12, 16 ohm ±0.1 ohm	1	03626
R6	PW2016C100000K	Res, 1.0K, .03%	1	03626
R7	RL07S621G	Res, 1/4W, 620 ohm, 2%	1	
R8	78P-R2K	Pot, 2K	1	80053
R9	RL07S151G	Res, 1/4W, 150 ohm, 2%	1	
R10	RL07SFSVG	Res, 1/4W, FSV, 1.5, 2.7 or 3.9K, 2%	1	
R11	RN60E3832F	Res, 1/8W, 38.3K, 1%	1	
R13	RN60E3832F	Res, 1/8W, 38.3K, 1%	1	
R14-15	RC07GF123J	Res, 1/4W, 12K, 5%	2	
R16	RL07S622G	Res, 1/4W, 6.2K, 2%	1	
R17-18	RL07S912G	Res, 1/4W, 9.1K, 2%	2	
R19	RC07GF101J	Res, 1/4W, 100K, 5%	1	
R20	RC07GF201J	Res, 1/4W, 200 ohm, 5%	1	
R21	450E2515	Res, 3W, 250	1	80183
R22	RL07S622G	Res, 1/4W, 6.2K, 2%	1	
R23	PW2016CFSVX	Res, FSV, 1, 2 or 3 ohm ±0.1 ohm	1	80183
R25	78P-R2K	Pot, 2K	1	80053
R26	PW2016CFSVF	Res, FSV, 39.5K, 40.0K, 40.5K, 0.1%	1	03626
R27	PW2016C1500K	Res, 1500 ohm, .03%	1	03626
R28	PW2016C14460K	Res, 1446.8 ohm, .03%	1	03626
R29	RL07S753G	Res, 1/4W, 75K, 2%	1	
R30-31	RL07S562G	Res, 1/4W, 5.6K, 2%	2	
R32	RL20S681G	Res, 1/2W, 680 ohm, 2%	1	
R33	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R34	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R35	RC07GF106J	Res, 1/4W, 10M, 5%	1	
R36	RC07GF395J	Res, 1/4W, 3.9M, 5%	1	

*Alternate

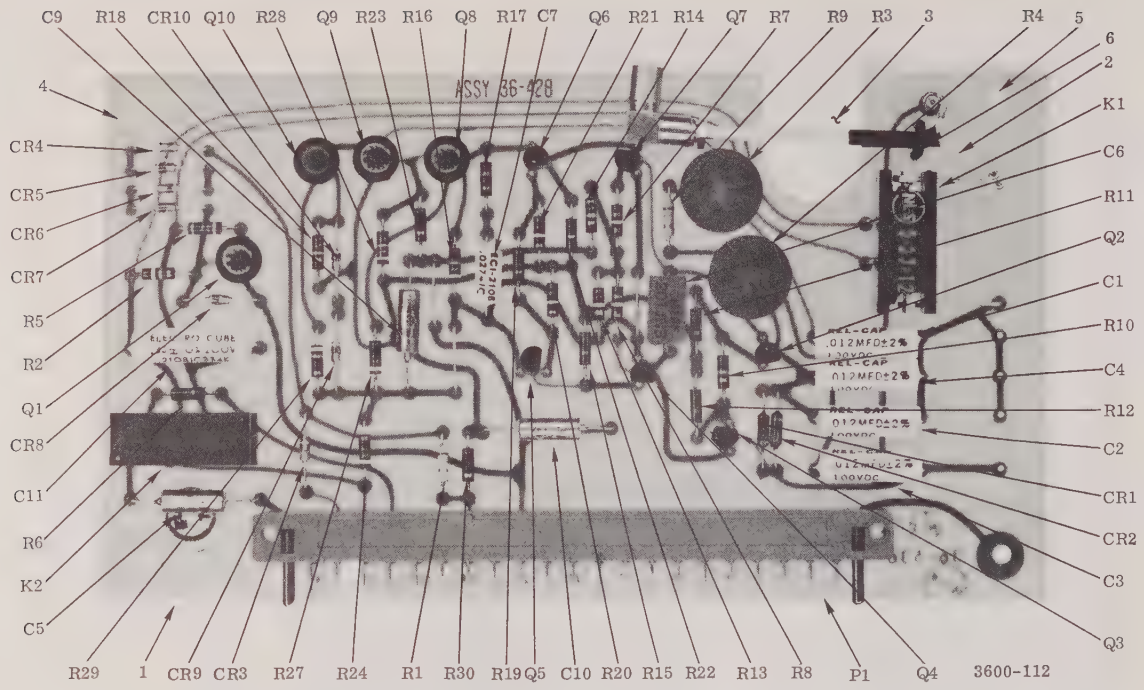


Figure 5-21. High Speed Active Filter Assembly, 36-428

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Hi Spd Active Filter	36-428	Assy, Active Filter, High Speed		
1	36-537	PC S/A, Active Filter	1	03626
2	RG188/AU	Cable	2-1/2"	70903
3	1127/188	Connector	1	15558
P1	00-7023-041-000-001	Connector	1	91662
5	36-192	Shield	1	03626
6	2000-20	Standoff, 3/16 Diam x 1/2 L	4	03626
7	2829-75-1	Strap, Rubber	1	98159
C1-4	413A1B123G	Cap, .012 MF, 100V, 2%	4	14752
C1-4	RT123H2A*	Cap		
C5	STA35B185K-1	Cap, 1.8 MF, 35V, 10%	1	12406
C6	CM 1SE-201J	Cap, 200 PF, 500V, 5%	1	04062
C7	210B1C273J	Cap, .027 MF, 200V, 5%	1	14752
C9-10	STA35B565K-1	Cap, 5.6 MF, 35V, 10%	2	12406
C11	210B1C334K	Cap, .33 MF, 200V, 10%	1	14752
C11	C281AB/A330K*	Capacitor, .33 MF, 250V, 10%		
CR1-2	1N458	Diode	2	02195
CR3-10	5003-002	Diode	8	03626

HIGH SPEED ACTIVE FILTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
K1	5-27-12	Relay	1	03626
K2	5-27-2	Relay	1	03626
Q1	SK6501	Transistor	1	01295
Q1	/2N3643*			
Q2-7	2N3707	Transistor	6	01295
Q8-10	SK7431A	Transistor	3	01295
	/2N3645*			
R1	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R2	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R3	PW2016NC89902M	Res, 1/4W, 899K, .05%	1	03626
R4	PW2016C46402N	Res, 1/4W, 464K, .1%	1	03626
R5	RL07S301G	Res, 1/4W, 300 Ohm, 2%	1	
R6	RC07GF106J	Res, 1/4W, 10M, 5%	1	
R7-8	RC07GF684J	Res, 1/4W, 680K, 5%	2	
R9	RC07GF183J	Res, 1/4W, 18K, 5%	1	
R10	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R11-12	RC07GF565J	Res, 1/4W, 5.6M, 5%	2	
R13	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R14	RC07GF823J	Res, 1/4W, 82K, 5%	1	
R15	RC07GF565J	Res, 1/4W, 5.6M, 5%	1	
R16	RL07S103G	Res, 1/4W, 10K, 2%	1	
R17	RC07GF681J	Res, 1/4W, 680 Ohm, 5%	1	
R18	RC07GF623J	Res, 1/4W, 62K, 5%	1	
R19	RC07GF102J	Res, 1/4W, 1K, 5%	1	
R20-21	RC07GF224J	Res, 1/4W, 220K, 5%	2	
R22	RC07GF565J	Res, 1/4W, 5.6M, 5%	1	
R23	RC07GF105J	Res, 1/4W, 1M, 5%	1	
R24	RC07GF201J	Res, 1/4W, 200 Ohm, 5%	1	
R27	RL07S202G	Res, 1/4W, 2K, 2%	1	
R28	RL07S513G	Res, 1/4W, 51K, 2%	1	
R30	RC07GF431J	Res, 1/4W, 430 Ohm, 5%	1	
R30	RC07GF201J	Res, 1/4W, 200 Ohm, 5%	1	

*Alternate

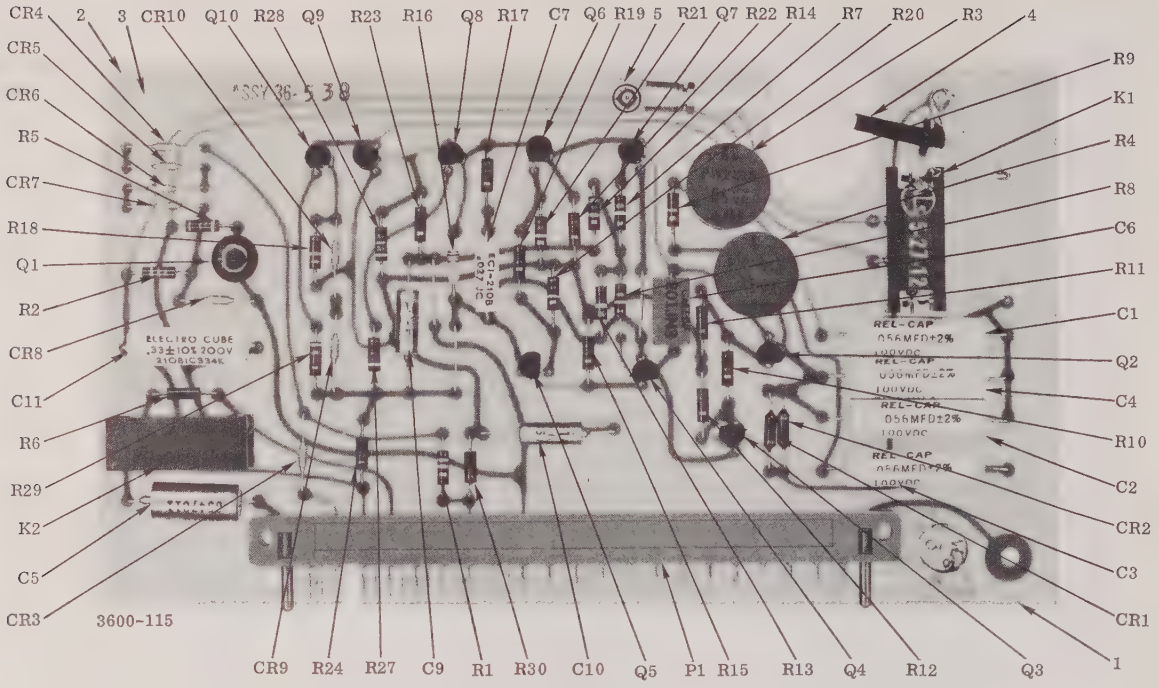


Figure 5-22. Low Speed Active Filter Assembly, 36-538

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Active Filter	36-538	Assy, Active Filter		
1	36-537	PC S/A, Active Filter	1	03626
2	36-192	Shield	1	03626
3	2000-20	Standoff	4	03626
4	RG188/AU	Cable	1	70903
5	1127/188	Connector	1	03626
P1	00-7023-041-000-001	Connector	1	91662
C1-C4	413A1B563F	Cap, .056 MF, 1%, 100V	4	14752
C5	STA35C106K-1	Cap, 10 MF, 10%, 35V	1	12406
C6	CM15E-201J	Cap, 200 PF, 5%, 500V	1	04062
C7	210B1C273J	Cap, .027 MF, 5%, 200V	1	14752
C9-10	STA35B565K-1	Cap, 5.6 MF, 10%, 35V	2	12406
C11	210B1C334K	Cap, .33 MF 10%, 200V	1	14752
CR1-2	1N458	Diode	2	01295
CR3-10	5003-002	Diode	8	03626
K1	5-27-12	Relay	1	03626
K2	5-27-2	Relay	1	03626
Q1	SK6501	Transistor	1	01295
Q1	2N3643*	Transistor	1	01295

ACTIVE FILTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q2-7	2N3707	Transistor	6	02195
Q8-10	SK7131A/2N3645*	Transistor	3	02195
R1	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R2	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R3	RC07GF201J	Res, 1/4W, 200 ohm, 5%	1	
R4	PW2016C46402N	Res, 1/4W, 464K, 0.1%	1	01121
R5	RL07S301G	Res, 1/4W, 300 ohm, 2%	1	
R6	RC07GF2054	Res, 1/4W, 2.0M, 5%	1	
R7-8	RC07GF684J	Res, 1/4W, 680K, 5%	2	
R9	RC07GF183J	Res, 1/4W, 18K, 5%	1	
R10	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R11-12	RC07GF565J	Rec, 1/4W, 5.6M, 5%	2	
R13	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R14	RC07GF823J	Res, 1/4W, 82K, 5%	1	
R15	RC07GF565J	Res, 1/4W, 5.6M, 5%	1	
R16	RL07S103G	Res, 1/4W, 10K, 2%	1	
R17	RC07GF681J	Res, 1/4W, 680 ohm	1	
R18	RC07GF623J	Res, 1/4W, 62K, 5%	1	
R19	RC07GF102J	Res, 1/4W, 1K, 5%	1	
R20-21	RC07GF224J	Res, 1/4W, 220K, 5%	2	
R22	RC07GF565J	Res, 1/4W, 5.6M, 5%	1	
R23	RC07GF105J	Res, 1/4W, 1.0M, 5%	1	
R24	RC07GF201J	Res, 1/4W, 200 ohm, 5%	1	
R27	RL07S202G	Res, 1/4W, 2K, 2%	1	
R28	RL07S513G	Res, 1/4W, 51K, 2%	1	
R29	RC07GF431J	Res, 1/4W, 430 ohm, 5%	1	

*Alternate

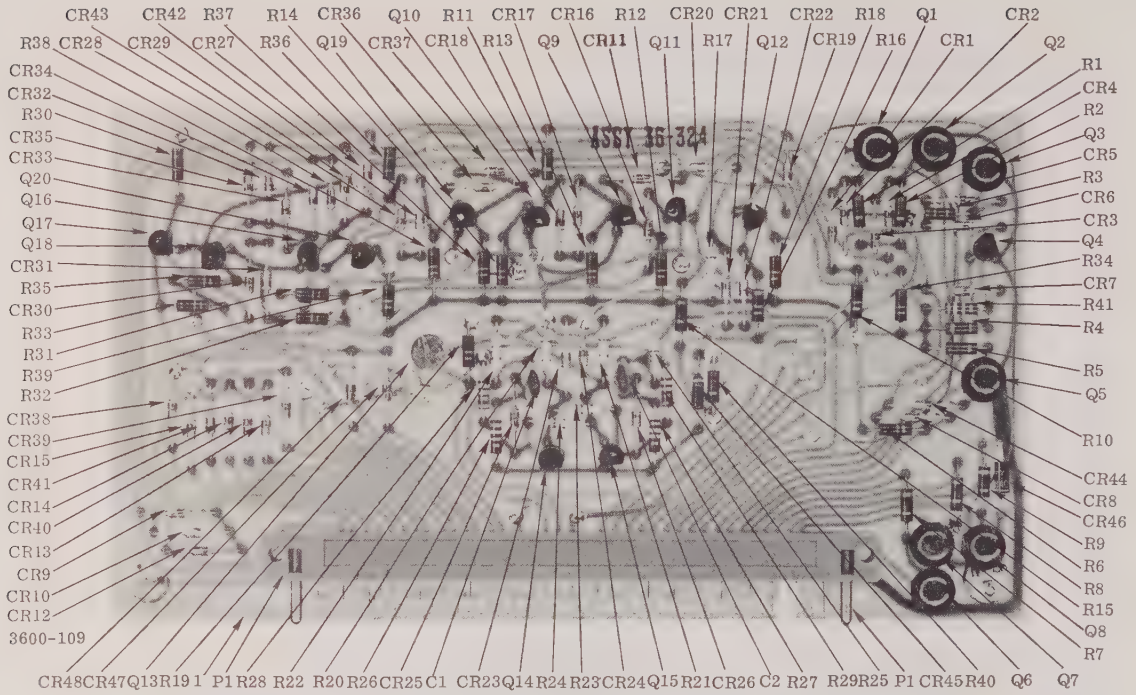


Figure 5-23. Range Decision Logic Assembly, 36-324

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Range Dec. Logic	36-324	Assy, Range Decision Logic		
1	36-323	PC S/A, Range Decision Logic	1	03626
P1	00-7023-041-000-001	Connector	1	91662
C1-2	5002-009	Cap, 200 PF ±20%, 500V	2	91418
CR1-44	5003-002	Diode	44	03626
CR45	1N961B	Diode, Zener, 10V	1	04713
CR46	1N4003	Diode	1	04713
CR47-48	5003-002	Diode	2	03626
Q1-3	2N3638A/2N3644	Transistor	3	07263
Q4	2N3906	Transistor	1	04713
Q4	2N3638A/2N3702*	Transistor	1	04713
Q5-8	2N3638A/2N3644	Transistor	4	07263
Q1-8	2N3645*	Transistor	8	07263
Q9-12	2N3906	Transistor	4	04713
Q9-12	2N3638A/2N3702*	Transistor	4	04713
Q13	2N1305	Transistor	1	04713
Q14-15	SK6501	Transistor	2	04713
Q16-20	2N3906	Transistor	5	04713
Q16-20	2N3638A/2N3702*	Transistor	5	04713

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
R1-2	RC07GF512J	Res, 1/4W, 5.1K, 5%	2	
R3	RC07GF682J	Res, 1/4W, 6.8K, 5%	1	
R4	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R5	RC07GF512J	Res, 1/4W, 5.1K, 5%	1	
R6	RC07GF203J	Res, 1/4W, 20K, 5%	1	
R7-9	RC07GF302J	Res, 1/4W, 3K, 5%	3	
R10	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R11	RC07GF682J	Res, 1/4W, 6.8K, 5%	1	
R12	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R13-14	RC-7GF103J	Res, 1/4W, 10K, 5%	2	
R15	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R16	RC07GF303J	Res, 1/4W, 30K, 5%	1	
R17	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R18	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R19	RC07GF203J	Res, 1/4W, 20K, 5%	1	
R20-21	RC07GF133J	Res, 1/4W, 13K, 5%	2	
R22	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R23-24	RC07GF163J	Res, 1/4W, 16K, 5%	2	
R25	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R26-29	RC07GF393J	Res, 1/4W, 30K, 5%	4	
R30	RC07GF682J	Res, 1/4W, 6.8K, 5%	1	
R31	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R32-33	RC07GF103J	Res, 1/4W, 10K, 5%	2	
R34-35	RC07GF104J	Res, 1/4W, 100K, 5%	2	
R36	RC07GF682J	Res, 1/4W, 6.8K, 5%	1	
R37	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R38-39	RC07GF103J	Res, 1/4W, 10K, 5%	2	
R40	RC07GF512J	Res, 1/4W, 5.1K, 5%	1	
R41	RC07GF393J	Res, 1/4W, 39K, 5%	1	

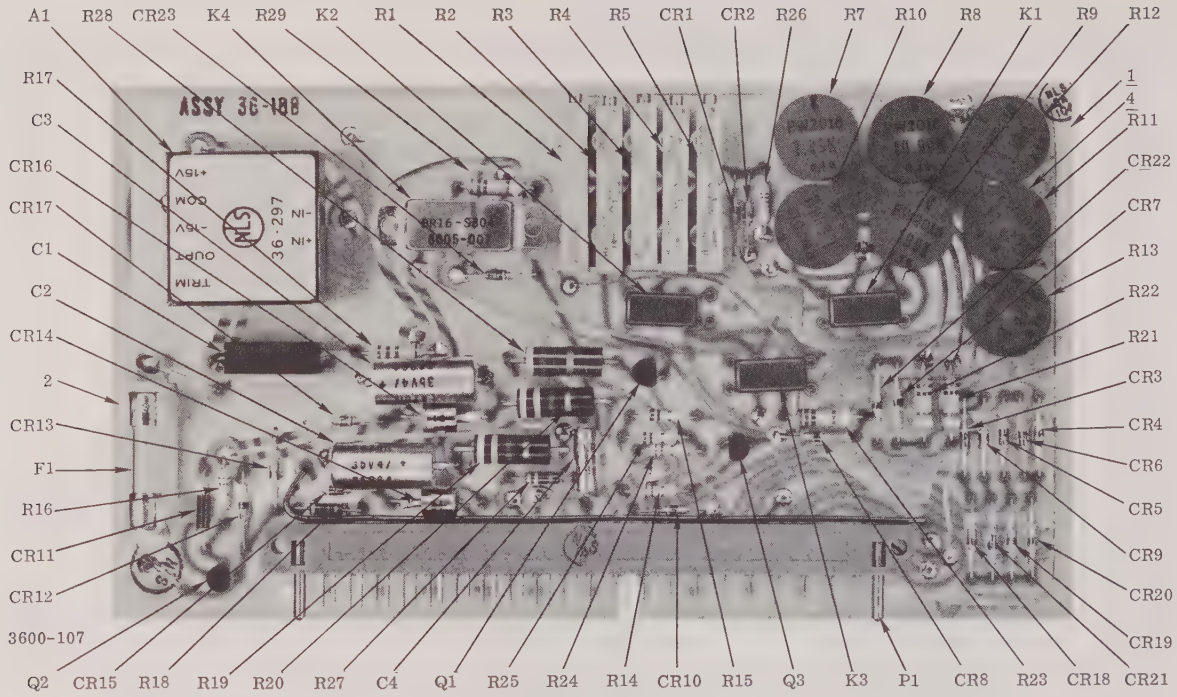


Figure 5-24. K Ohm/DC Converter Assembly, 36-188

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
K OHM/DC	36-188	Assy, K OHM/DC Converter		
1	36-361	PC S/A, K OHM/DC Converter		03626
2	121004	Fuse Clips	2	75915
3	380598.2	Socket, Insert	7	00779
4	88006	Transipad	3	17065
5	LH-01	Socket, Quik-Sert	32	03626
P1	000-7023-041-000-001	Connector	1	91662
A1	36-297	Amplifier	1	03626
C1	PD1X103	Cap, .01 MF, 100V	1	12406
C2-3	STA826-1	Cap, 47 MF, 35V	1	12406
C4	CS13AF5R6K	Cap, 5.6 MF, 35V	1	03626
CR1-10	5003-002	Diode	10	03626
CR11	1N752A/1N 708A	Diode, Zener	1	04713
CR12-13	5003-002	Diode	2	03626
CR14	1N3024B	Diode, Zener	1	15653
CR15	5003-002	Diode	1	03626
CR16	1N3024B	Diode, Zener	1	15653
CR17-23	5003-002	Diode	7	03626
F1	361.375	Fuse, 3/8 AMP, 8AG	1	75915

K OHM/DC CONVERTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
K1-3	HP11D-24V	Relay	3	77342
K4	5005-007	Relay	1	03626
Q1-3	SK6501/2N3643	Transistor	3	01295
R1	78-R20	Pot 20 OHM	1	73138
R2	78P-R200	Pot 200 OHM	1	73138
R3	78P-R2K	Pot, 2K	1	73138
R4	78P-R20K	Pot, 20K	1	73138
R5	78P-R200	Pot, 200 OHM	1	73138
R7	PW2016119900N	Res, 1.990K, .1%	1	03626
R8	PW2016119901N	Res, 19.90K, .1%	1	03626
R9	PW2016119902N	Res, 199.0K, .1%	1	03626
R10	PW2016119903N	Res, 1.990M, .1%	1	03626
R11	PW2016117891N	Res, 17.892K, .1%	1	03626
R12	PW20161199	Res, 1.990K, .1%	1	03626
R13	PW2016119903N	Res, 1.990M, .1%	1	03626
R14	RC07GF163J	Res, 1/4W 16K, 5%	1	
R15	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R16	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R17	RCZ0GF101J	Res, Y2W, 100 OHM, 5%	1	
R18	RC07GF752J	Res, 1/4W, 7.5K, 5%	1	
R19-20	RC32GF471J	Res, 1W, 470 OHM, 5%	2	
R21-23	RL20S681G	Res, 1/2W, 680 OHM, 2%	3	
R24	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R25	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R26	RC07GF152J	Res, 1/4W, 1.5K, 5%	1	
R27	RC07GF395J	Res, 1/4W, 3.9M, 5%	1	
R28	RC32GF362J	Res, 1W, 3.6K, 5%	1	
R29	RL20S681G	Res, 1/2W, 680 OHM, 2%	1	

*Alternate

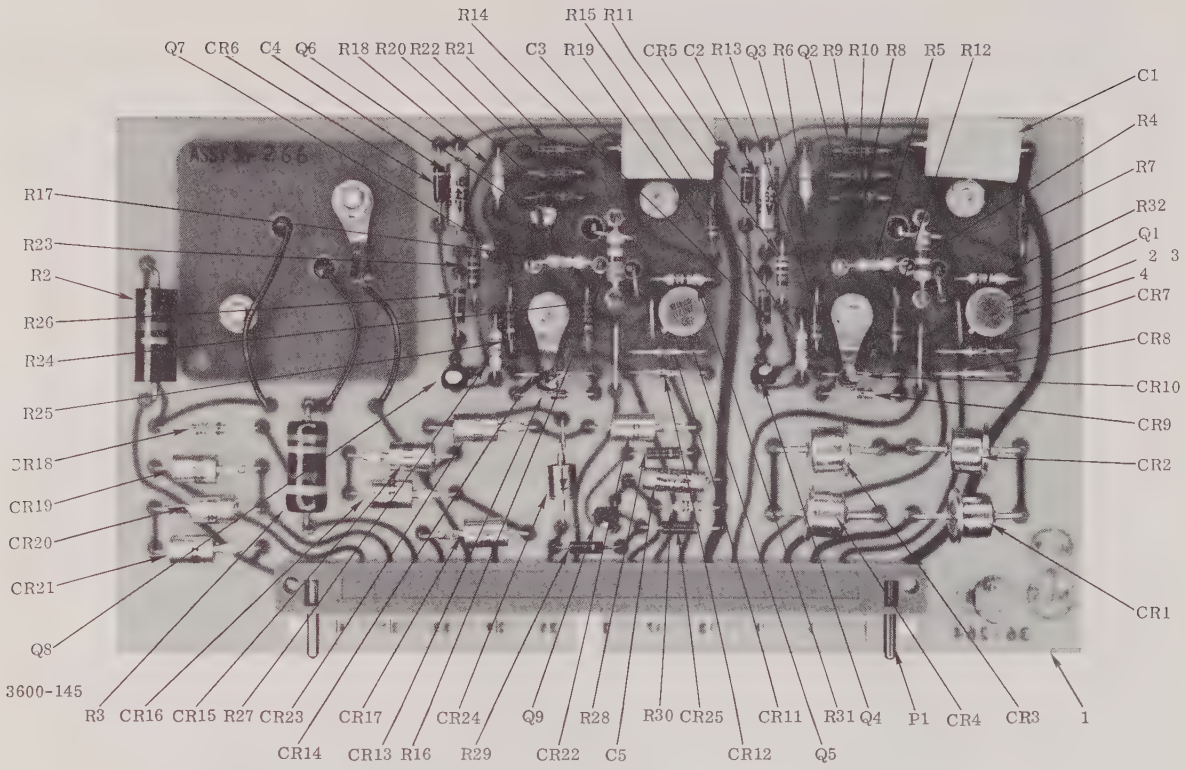


Figure 5-25. Regulator Assembly, 36-266

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Regulator	36-266	Assy, Regulator		
1	36-265	PC S/A, Regulator	1	03626
2	NC680-1.25A	Heat Sink Assy	3	05820
3	2006-25	Spacer, 3/16 lg.	4	03626
4	A10032	Transipad	2	07047
P1	00-7023-041-000-001	Connector	1	91662
C1	C281AB/A220K	Cap, .22 MF, 25V	1	73445
C2	STA684-1	Cap, 5.6 MF, 35V	1	12406
C3	C281AB/A220K	Cap, .22 MF, 250V	1	73445
C4-5	STA684-1	Cap, 5.6 MF, 35V	1	12406
CR1-4	1N4720	Rectifier, Silicon	4	04713
CR1-4	S8363*	Rectifier, Silicon	4	04713
CR5-6	1N970B	Diode, Zener, 24V, 5%, 4W	2	04713
CR7-14	5003-002	Diode	8	03626
CR15-17	1N3826A	Diode, Zener, 5.1V, 5%, 1W	3	04713
CR18	1N705A	Diode, Zener, 5.1V, 5%, 1/4W	1	04713
CR18	1/4 M5.1AZ*	Diode	1	04713
CR19-24	1N3826A	Diode, Zener, 5.1V, 5%, 1W	6	04713
CR25	1N706A	Diode, Zener, 5%, 1/4W	1	04713

REGULATOR ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q1	2N1711	Transistor	1	01295
Q2-3	2N3702	Transistor	2	04713
Q4	2N3711	Transistor	1	04713
Q5	2N1711	Transistor	1	01295
Q6-7	2N3702	Transistor	1	04713
Q8	2N3711	Transistor	1	04713
Q9	2N3644	Transistor	1	07263
Q9	SK7431/2N3645*	Transistor	1	07263
Q10-12	2N3615	Transistor	3	04713
R2	RC42GF562J	Res, 2W, 5.6K, 5%	1	
R3	L42	Res, 2W, 39 ohm, 2%	1	75042
R4	RC32GFFSVJ	Res, 1/2W, 100 ohm, 200 ohm, 300 ohm, 390 ohm, 5% (factory selected)	1	
R5	RL07SFSVG	Res, 1/4W, 1.8K, 2.2K, 2.7K, 3.3K, 3.9K, 4.3K, 4.7K, 5.1K, 5.6K, 2% (factory selected)	1	
R6	RL07S153G	Res, 1/4W, 15K, 2%	1	
R7	RL07GF113J	Res, 1/4W, 11K, 5%	1	
R8	RL07GF101J	Res, 1/4W, 100 ohm, 5%	1	
R9	RL07GF113J	Res, 1/4W, 11K, 5%	1	
R10	RL07GF101J	Res, 1/4W, 100 ohm, 5%	1	
R11	RL07GF393J	Res, 1/4W, 39K, 5%	1	
R12-13	RL07GF222J	Res, 1/4W, 2.2K, 5%	1	
R14	RL07GF302J	Res, 1/4W, 3.0K, 5%	1	
R15	RL07GF131J	Res, 1/4W, 130 ohms, 5%	1	
R16	RC32GFFSVJ	Res, 1/2W, 100 ohm, 200 ohm, 300 ohm, 390 ohm, 5% (factory selected)	1	
R17	RL07SVSVG	Res, 1/4W, 1.8K, 2.2K, 2.7K, 3.3K, 3.9K, 4.3K, 4.7K, 5.1K, 5.6K, 2% (factory selected)	1	
R18	RL07S153G	Res, 1/4W, 15K, 2%	1	
R19	RL07GF113J	Res, 1/4W, 11K, 5%	1	
R20	RL07GF101J	Res, 1/4W, 100 ohms, 5%	1	
R21	RL07GF113J	Res, 1/4W, 11K, 5%	1	
R22	RL07GF101J	Res, 1/4W, 100 ohms, 5%	1	
R23	RL07GF393J	Res, 1/4W, 39K, 5%	1	
R24-25	RL07GF222J	Res, 1/4W, 2.2K, 5%	1	
R26	RL07GF302J	Res, 1/4W, 3.0K, 5%	1	
R27	RL07GF131J	Res, 1/4W, 130 ohm, 5%	1	
R28	RL07GF222J	Res, 1/4W, 2.2K, 5%	1	
R29	RL07GF102J	Res, 1/4W, 1.0K, 5%	1	
R30	RL07GF751J	Res, 1/4W, 750 ohm, 5%	1	
R31-32	RL07GF510J	Res, 1/4W, 51 ohm, 5%	1	

*Alternate

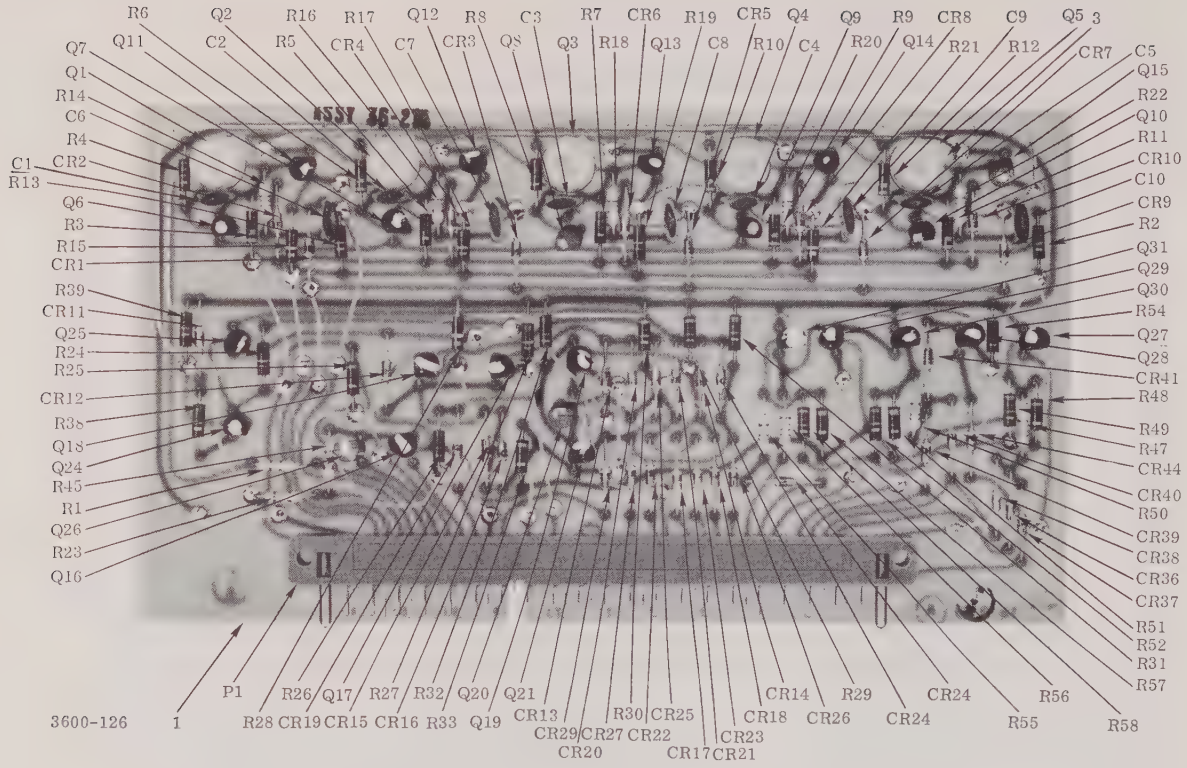


Figure 5-26. Scan Counter Assembly, 36-275

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Scan Counter	36-275	Assy, Scan Counter		
1	36-274	PC S/A, Scan Counter	1	03626
2	TO5	Cap, Plastic	5	03626
3	A10032	Transipad	5	07047
P1	00-7023-041-000-001	Connector	1	91662
C1-5	5002-009	Cap, 220PF, 500V	5	91418
C6-10	5002-010	Cap, .002 MF, 500V	5	91418
CR1-27	5003-002	Diode	27	03626
CR29	5003-002	Diode	1	03626
CR36-42	5003-002	Diode	7	03626
CR44	5003-002	Diode	1	03626
Q1-5	2N1305	Transistor	5	01295
Q6-10	2N3904	Transistor	4	04713
Q6-10	/2N3565*	Transistor	4	04713
Q6-10	/2N3711*	Transistor	4	04713
Q11-21	2N3906	Transistor	11	04713
Q11-21	/2N3638A*	Transistor	11	04713
Q11-21	/2N3702*	Transistor	11	04713

SCAN COUNTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q24	2N3904	Transistor	1	04713
Q24	/2N3565*	Transistor	1	04713
Q24	/2N3711*	Transistor	1	04713
Q25-31	2N3906	Transistor	7	04713
Q25-31	/2N3638A*	Transistor	7	04713
Q25-31	/2N3702*	Transistor	7	04713
R1	RC07GF363J	Res, 1/4W, 36K, 5%	1	
R2	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R3-12	RC07GF222J	Res, 1/4W, 2.2K, 5%	10	
R13	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R14	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R15	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R16	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R17	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R18	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R19	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R20	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R21	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R22	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R23	RC07GF123J	Res, 1/4W, 12K, 5%	1	
R24	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R25	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R26	RC07GF152J	Res, 1/4W, 1.5K, 5%	1	
R27-28	RC07GF104J	Res, 1/4W, 100K, 5%	2	
R29-31	RC07GF363J	Res, 1/4W, 36K, 5%	3	
R32	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R33	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R38-39	RC07GF103J	Res, 1/4W, 10K, 5%	2	
R45	RC07GF622J	Res, 1/4W, 6.2K, 5%	1	
R47	RC07GF182J	Res, 1/4W, 1.8K, 5%	1	
R48	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R49	RC07GF363J	Res, 1/4W, 36K, 5%	1	
R50	RC07GF182J	Res, 1/4W, 1.8K, 5%	1	
R51	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R52	RC07GF363J	Res, 1/4W, 36K, 5%	1	
R54	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R55	RC07GF622J	Res, 1/4W, 6.2K, 5%	1	
R56	RC07GF182J	Res, 1/4W, 1.8K, 5%	1	
R57	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R58	RC07GF363J	Res, 1/4W, 36K, 5%	1	

*Alternate

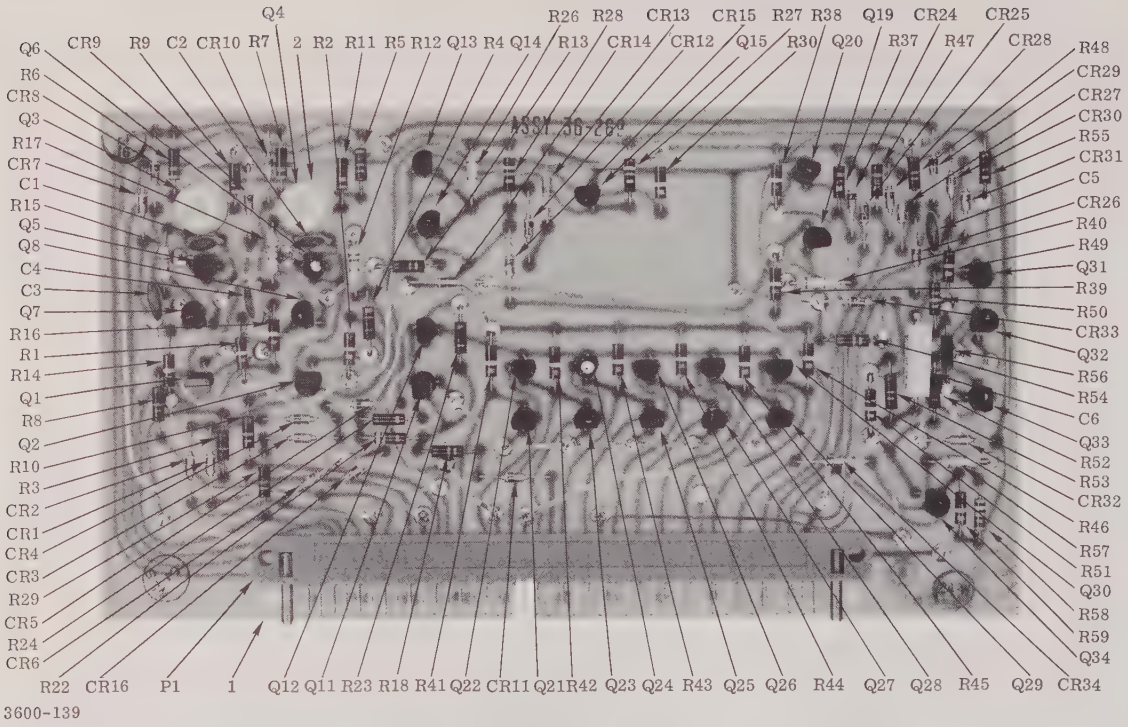


Figure 5-27. Polarity FF & Logic Assembly, 36-269

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Polarity FF & Logic	36-269	Assy, Polarity FF & Logic		
1	36-268	PC S/A, Pol. FF & Logic		
2	A10032	Transipad	2	07047
P1	00-7023-041-000-001	Connector	1	03626
C1-2	5002-009	Cap, 220 PF, 500V	2	91418
C3-5	5002-010	Cap, .002 MF, 500V	3	91418
C6	VX1X104	Cap, 0.1 MF, 100V	1	12406
C6	C281AB*/A100K	Cap, .1 MF, 250V ±10%	1	03626
CR1-16,	5003-002	Diode	27	03626
CR24-34	5003-002	Diode	11	03626
Q1-2	2N3904/2N3711*	Transistor	2	01295
Q3-4	2N1305	Transistor	2	01295
Q5-6	2N3904/2N3711*	Transistor	2	01295
Q7-8	2N3906/2N3638A*/2N3702*	Transistor	8	01295
Q11-12	2N3904/2N3711*	Transistor	2	01295
Q13-15	2N3906	Transistor	3	01295
Q19-20	/2N3638A*/2N3702	Transistor	3	01295

POLARITY FF & LOGIC ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q21-33	2N3904/2N3711*	Transistor	13	01295
Q34	2N3906/2N3638A* /2N3702*	Transistor	1	01295
R1-2	RC07GF104J	Res, 1/4W, 100K, 5%	2	
R3	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R4	RC07GF332J	Res, 1/4W, 3.3K, 5%	1	
R5	RC07GF363J	Res, 1/4W, 36K, 5%	1	
R6-7	RC07GF222J	Res, 1/4W, 2.2K, 5%	2	
R8	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R9	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R10	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R11	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R12	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R13	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R14	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R15	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R16	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R17	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R18	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R22	RC07GF472J	Res, 1/4W, 4.7K, 5%	1	
R23	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R24	RC07GF152J	Res, 1/4W, 1.5K, 5%	1	
R25	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R27-28	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R29	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R30	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R37	RC07GF682J	Res, 1/4W, 6.8K, 5%	1	
R38-39	RC07GF104J	Res, 1/4W, 100K, 5%	2	
R40	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R41-46	RC07GF104J	Res, 1/4W, 100K, 5%	6	
R47	RC07GF682J	Rex, 1/4W, 6.8K, 5%	1	
R48	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R49	RC07GF203J	Res, 1/4W, 20K, 5%	1	
R50	RC07GF623J	Res, 1/4W, 62K, 5%	1	
R51	RC07GF134J	Res, 1/4W, 130K, 5%	1	
R52-54	RC07GF103J	Res, 1/4W, 10K, 5%	4	
R55	RC07GF202J	Res, 1/4W, 2K, 5%	1	
R56	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R57	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R58	RC07GF393J	Res, 1/4W, 39K, 5%	1	
R59	RC07GF104J	Res, 1/4W, 100K, 5%	1	

*Alternate

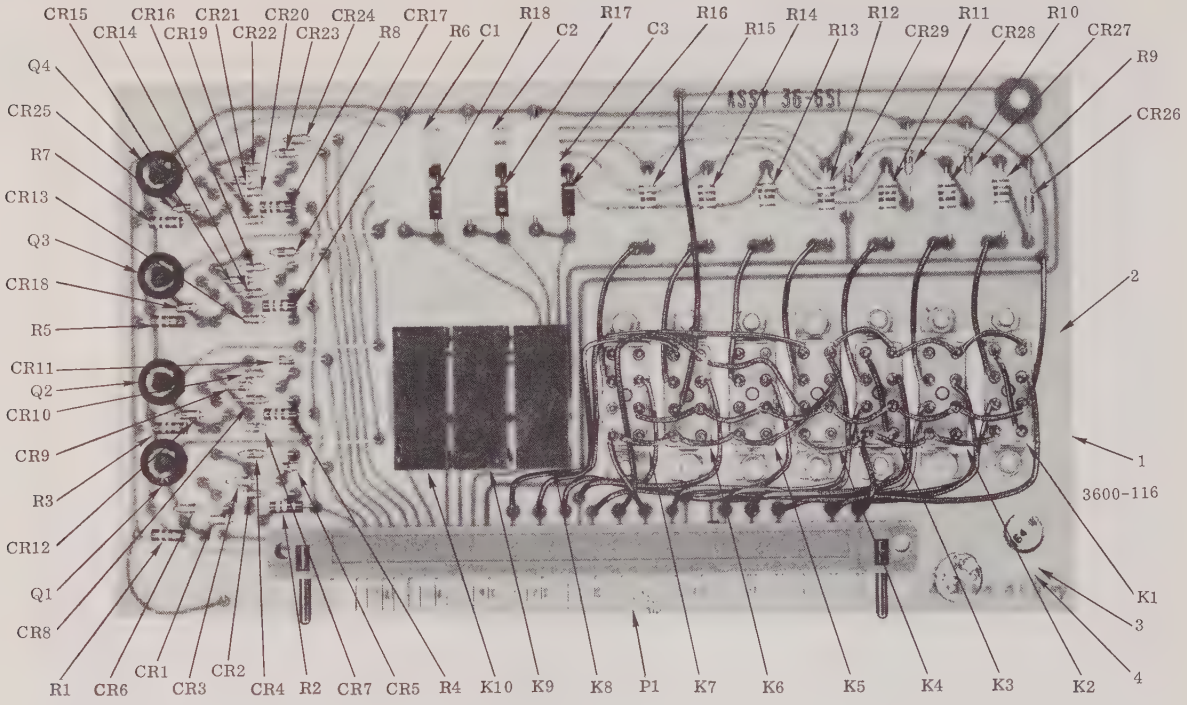


Figure 5-28. Function Switching Assembly, 36-651

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Function Switching	36-651	Assy, Function Switching		
1	36-650	PC S/A, Function SW	1	36-650
2		Screw, 4-40 x 3/16" Round Head, P. R.	4	03626
3	36-192	Shield	2	03626
4	2001-24	Standoff, Hex, 4-40	4	03626
5	9723-A-0440-16(4)	Standoff, Hex, 3/16	4	06540
C1-3	VX1X154	Cap, .15/100V	3	12406
C1-3	C281AB/A150K*	Cap, .15/250V	3	12406
C1-3	VX1A154*	Cap, .15/100V	3	12406
CR1-29	5003-002	Diode	29	03626
K1-7	5005-007	Relay	7	03626
K8-10	5-27-2	Relay	3	03626
Q1-4	2N3643/SK6501	Transistor	4	07263/01295
R1	RC07GF243J	Res, 1/4W, 24K, 5%	1	75042
R2	RC07GF133J	Res, 1/4W, 13K, 5%	1	75042
R3	RC07GF243J	Res, 1/4W, 24K, 5%	1	75042
R4	RC07GF133J	Res, 1/4W, 13K, 5%	1	75042
R5	RC07GF243J	Res, 1/4W, 24K, 5%	1	75042
R6	RC07GF133J	Res, 1/4W, 13K, 5%	1	75042

FUNCTION SWITCHING ASSY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
R7	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R8	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R9-15	RL20S681G	Res, 1/2W, 680 ohm, 2%	1	
R16-18	RC07GF471J	Res, 1/4W, 470 ohm, 5%	1	

*Alternates

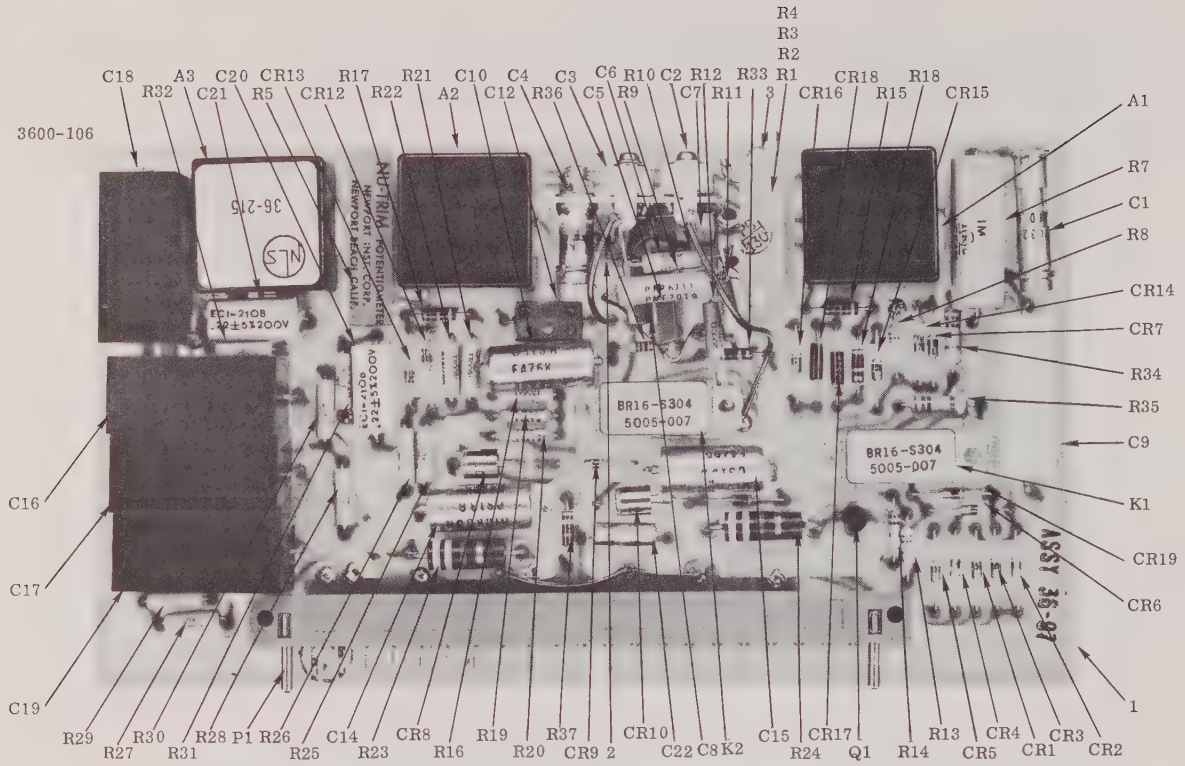


Figure 5-29. AC Converter Assembly (10K Hz), 36-97

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
AC/DC Converter	36-97	Assy, AC/DC Converter		
1	36-328	PC S/A, AC/DC Converter	1	03626
2	36-359	Bracket, Cap Mtg.	1	03626
3	1002-031	Screw, Pan Hd. #2-56 x 1"	2	03626
P1	00-7023-041-000-001	Connector	1	91662
A1-2	36-214	Amplifier	2	03626
A3	36-215	Amplifier	1	03626
C1	VC32GWY	Cap, .8-18 PF, 750V	1	73899
C2	403	Cap, 3-35 PF, 750V	1	04062
C3	402	Cap, 1.5-20 PF, 750V	1	04062
C4	NVC20G	Cap, .8-11 PF, 750V	1	73899
C5	CM15E131G	Cap, 130 PF, 500V, 2%	1	04062
C5	DM15F131G*	Cap, 130 PF, 500V, 2%	1	04062
C6	CM20E512F	Cap, 5100 PF, 500V, 1%	1	04062
C7	CM15E501F	Cap, 500 PF, 500V, 1%	1	04062
C8	CM15E430G	Cap, 43 PF, 500V, 1%	1	04062
C9	CM1CG/A220K	Cap, .22 PF, 630V, 10%	1	73445
C10	STA826-1	Cap, 47 MF, 35V, 10%	1	12406

AC/DC CONVERTER ASSY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
C12	CM15E100J	Cap, 10 PF, 500V, 5%	1	04062
C14-15	STA826-1	Cap, 47 MF, 35V, 10%	1	12406
C16-19	ZX2X205K	Cap, 2 MF, 200V, 10%	4	12406
C20-21	C281AB/B220K	Cap, .22 MF, 200V, 5%	2	73445
C22	CS13AF5R6K	Cap, 5.6 MF, 35V, 10%	1	03626
CR1-7	5003-002	Diode	7	03626
CR8	1N3024B	Diode, Zener	1	15653
CR9	5003-002	Diode	1	03626
CR10	1N3024B	Diode, Zener	1	15653
CR11	5003-002	Diode	1	03626
CR12-13	1N916	Diode	2	01295
CR14-16	5003-002	Diode	3	03626
CR17-18	1N752A	Diode	2	75042
CR19	5003-002	Diode	1	03626
K1-2	5005-007	Relay	2	03626
Q1	SK6501	Transistor	1	01295
Q1	2N3643*	Transistor	1	01295
R1	78P-R200	Pot, 200 ohm	1	73138
R2	78P-R2K	Pot, 2K	1	73138
R3	78P-R20K	Pot, 20K	1	73138
R4	78P-R200K	Pot, 200K	1	73138
R5	2PC503	Pot, 50K	1	NU-TRIM
R7	RN75E1004F	Res, 1W, 1M, 1%	1	
R8	RC07GF152J	Res, 1/4W, 1.5K, 5%	1	
R9	RN70E2004F	Res, 1/2W, 2M, 1%	1	
R10	RN60E2003F	Res, 1/8W, 200K, 1%	1	
R11	RN60E2002F	Res, 1/8W, 20K, 1%	1	
R12	RN60E2001F	Res, 1/8W, 2K, 1%	1	
R13	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R14	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R15	RL07S223G	Res, 1/4W, 22K, 2%	1	
R16	RN60E4991F	Res, 1/8W, 4.99K, 1%	1	
R17	RL07S223G	Res, 1/4W, 22K, 2%	1	
R18	RC07GF303J	Res, 1/4W, 30K, 5%	1	
R19-20	RN60E1002F	Res, 1/8W, 10K, 1%	2	
R21-22	RN60E1501F	Res, 1/8W, 1.5K, 1%	2	
R23-24	RC32GF471J	Res, 1W, 470 ohm, 5%	2	
R25	RN60E2002F	Res, 1/8W, 20K, 1%	1	
R30	RN60E2002F	Res, 1/8W, 20K, 1%	1	
R31-32	RN60E1503F	Res, 1/8W, 150K, 1%	1	
R33	RC07GF303J	Res, 1/4W, 30K, 5%	1	
R34-35	RL20S681G	Res, 1/2W, 680 ohm, 2%	1	
R36	RC07GF101J	Res, 1/4W, 10 ohm, 5%	1	
R37	RC07GF395J	Res, 1/4W, 3.9M, 5%	1	

*Alternate

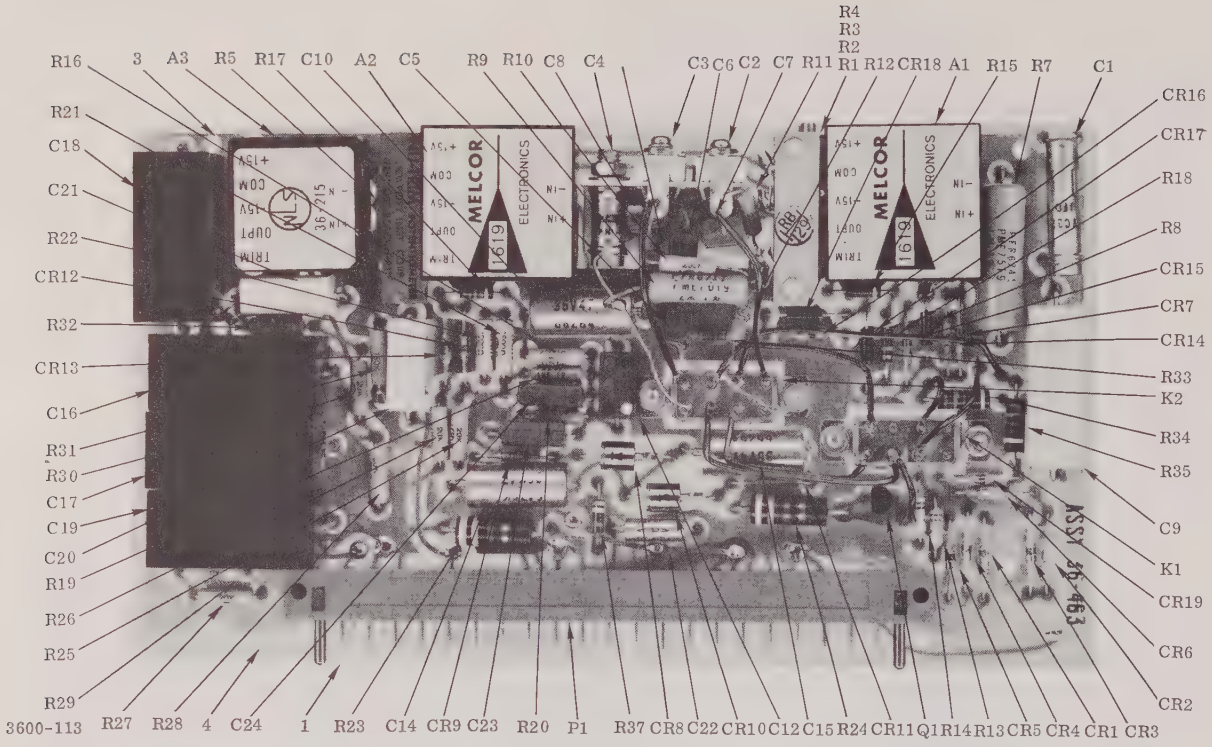


Figure 5-30. AC Converter Assembly (100K Hz), 36-463

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
AC/DC Conv.	36-463	Assy, AC/DC Converter		
1	36-462	PC S/A, AC/DC Converter	1	03626
2	36-359	Bracket, Mtg.	1	03626
3	2000-22	Standoff	4	03626
4	36-27	Shield	1	03626
P1	00-7023-041-000-001	Connector	1	91662
A1-2	1619	Amplifier	2	13656
A3	36-215	Amplifier	1	03626
C1	VC32GWY	Cap, .8-18 PF, 250V	1	73899
C2	403	Cap, 3-35PF, 125V	1	04062
C3	402	Cap, 1.5-20 PF, 175V	1	04062
C4	NVC20G	Cap, .8-11 PF, 750V	1	73899
C5	CM15E131G	Cap, 130 PF, 500V	1	04062
C6	CM20E512F	Cap, 5100 PF, 300V	1	04062
C7	CM15E501F	Cap, 500 PF, 500V	1	04062
C8	CM15E430G	Cap, 43 PF, 500V	1	04062
C9	C281CG/A220K	Cap, .22 MF, 630V	1	73445
C10	STA826-1	Cap, 47 MF, 35V	1	12406
C12	CM15E270J	Cap, 27 PF, 500V	1	04062

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
C14-15	STA826-1	Cap, 47 MF, 35V	2	12406
C16-19	ZX2X205K	Cap, 2MF, 200V	4	12406
C20-21	C281AB/B220K	Cap, .22 MF, 250V	2	73445
C22	CS13AF5R6K	Cap, 5.6 MF, 35V	1	03626
C23-24	CM15C200J	Cap, 20 PF, 500V	2	04062
CR1-7	5003-002	Diode	7	03626
CR8	1N3024B	Diode, Zener	1	15653
CR9	5003-002	Diode	1	03626
CR10	1N3024B	Diode, Zener	1	15653
CR11	5003-002	Diode	1	03626
CR12-13	1N916	Diode	1	01295
CR14-16	5003-002	Diode	3	03626
CR17-18	1N752A	Diode, Zener	2	75042
CR19	5003-002	Diode	1	03626
K1-2	5005-007	Relay	2	03626
Q1	SK6501/2N3643	Transistor	1	01295
R1	78P-R200	Pot, 200 ohms	1	73138
R2	78P-R2K	Pot, 2K	1	73138
R3	78P-R20K	Pot, 20K	1	73138
R4	78P-R200K	Pot, 200K	1	73138
R5	2PC202	Pot, 2K	1	73138
R7	RN75E1004F	Res, 1W, 1M, 1%	1	
R8	RC07GF152J	Res, 1/4W, 1.5K, 5%	1	
R9	RN70E2004F	Res, 1/4W, 2M, 1%	1	
R10	RN60E2003F	Res, 1/8W, 200K, 1%	1	
R11	RN60E2002F	Res, 1/8W, 20K, 1%	1	
R12	RN60E2001F	Res, 1/8W, 2K, 1%	1	
R13	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R14	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R15	RL07S112G	Res, 1/8W, 1.1K, 2%	1	
R16	RN60E4991F	Res, 1/8W, 4.99K, 1%	1	
R17	RL07S223G,	Res, 1/8W, 22K, 2%	1	
R18	RC07GF303J	Res, 1/4W, 30K, 5%	1	
R19-20	RN60E1002F	Res, 1/4W, 10K, 1%	2	
R21-22	RN60E1501F	Res, 1/8W, 1.5K, 1%	2	
R23-24	RC32GF471J	Res, 1W, 470 ohm, 5%	2	
R25-30	RN60E2002F	Res, 1/8W, 20K, 1%	6	
R31-32	RN60E1503F	Res, 1/8W, 150K, 1%	2	
R33	RC07GF303J	Res, 1/4W, 30K, 5%	1	
R34-35	RL20S681G	Res, 1/2W, 680 ohm, 2%	2	
R37	RC07GF395J	Res, 1/4W, 3.9M, 5%	1	

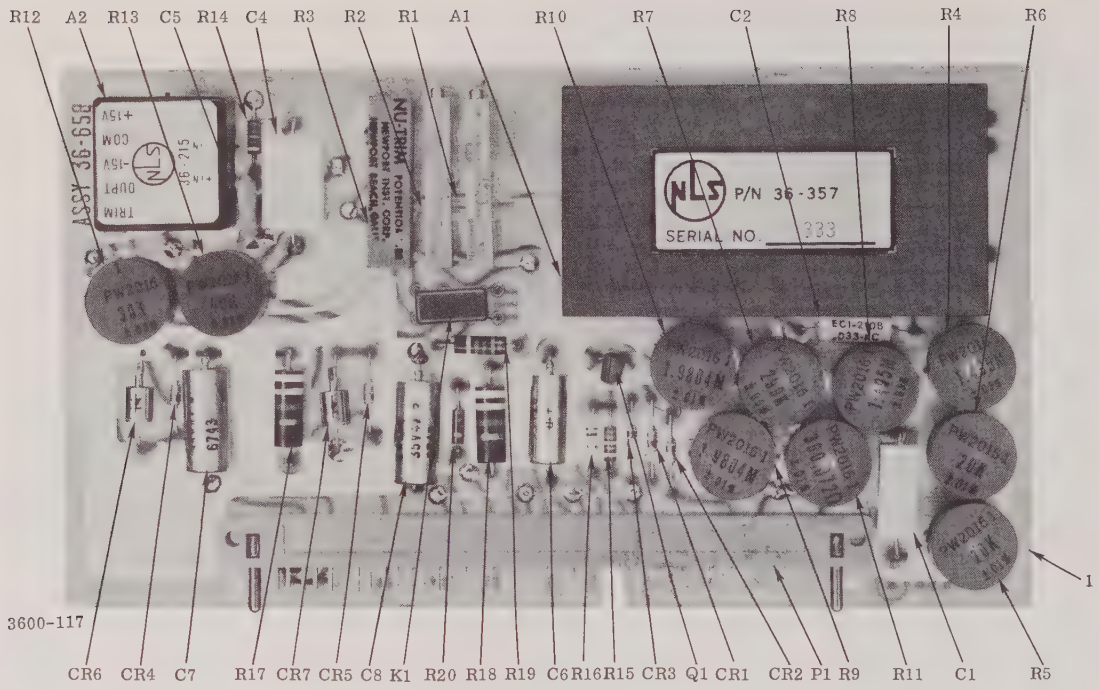


Figure 5-31. MV Converter Assembly, 36-658

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
MV Converter	36-658	Assy, MV Converter		
1	36-657	PC S/A, Pre-amp	1	03626
P1	00-7023-041-000-001	Connector	1	91662
3	380598-2	Socket, In-Sert	16	00779
4	LH-01	Socket, Quik-Sert	8	99779
A1	36-357	Amplifier	1	03626
A2	36-215	Amplifier	1	03626
C1	C281AB/A220K	Cap, .22 MF, 200V	1	73449
C1	210B1C224*	Cap, .22 MF, 200V	1	73449
C2	C281AB/A33K	Cap, .033 MF, 200V	1	73445
C2	ZX2X33K*	Cap, .033 MF, 200V	1	73445
C2	210B1C333*	Cap	1	73445
C4	C281AB/A220K	Cap, .22 MF, 200V	1	73449
C4	210B1C224*	Cap	1	73449
C5	BT.01	Cap, .01 MF, 100V, 20%	1	91418
C6	STA35C-106K-1	Cap, 10 MF, 35V	1	12406
C7-8	STA826-1	Cap, 47 MF, 35V	2	12406
CR1-5	5003-002	Diode	5	03626
CR6-7	1N3024B	Diode Zener	2	15653

MV CONVERTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
K1	5005-007	Relay	1	03626
Q1	SK6501/2N3643*	Transistor	1	01295
R1	78P-R20K	Pot, 20K	1	73138
R2	78P-R2K	Pot, 2K	1	73138
R3	2PK	Pot, 50K	1	03626
R4	PW2016I14953M	Res, 1/4W, 1.495M, .05%	1	03626
R5-6	PW2016I20001F	Res, 1/4W, 20K, .01%	2	03626
R7	PW2016I29902M	Res, 1/4W, 299K, .05%	1	03626
R8	PW2016I14953M	Res, 1/4W, 1.495M, .05%	1	03626
R9-10	PW2016I1980400F	Res, 1/4W, 1.9804M, .01%	2	03626
R11	PW2016I360072F	Res, 1/4W, 360, 072 ohm, .01%	1	03626
R12	PW2016I30001M	Res, 1/4W, 30K, .05%	1	03626
R13	PW2016I40001M	Res, 1/4W, 40K, .05%	1	03626
R14-15	RL07S163G	Res, 1/4W, 16K, 2%	2	
R16	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R17-18	RC32GF471J	Res, 1/4W, 470 ohm, 5%	2	
R19	RL20S681G	Res, 1/2W, 680 ohm, 2%	1	
R20	RC07GF185J	Res, 1/4W, 1.8M, 5%	1	

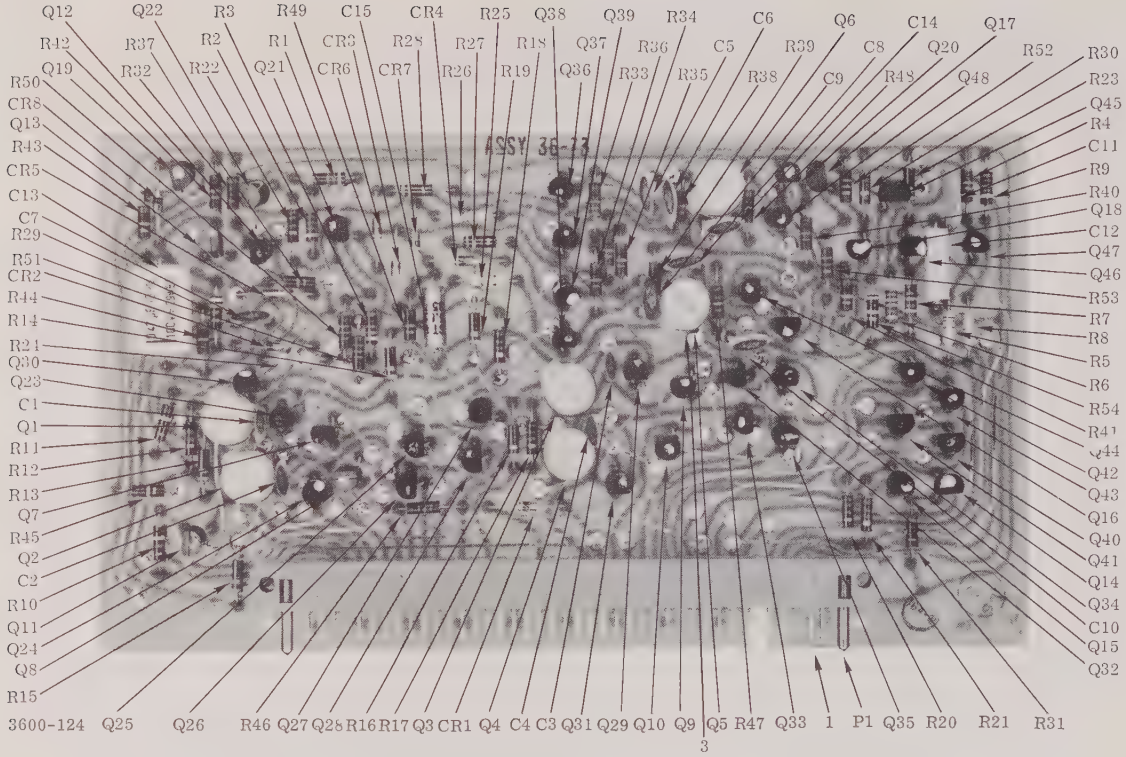


Figure 5-32. Threshold & Clock Assembly, 36-73

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Threshold & Clock	36-73	Assy, Threshold & Clock		
1	36-72	PC S/A, Threshold & Clock	1	03626
2	TO5	Cap, Plastic	1	01295
3	A10032	Transipad	1	07047
P1	00-7023-041-000-001	Connector	1	03626
C1-4	5002-009	Cap, 220 PF, 500V, 20%	4	91418
C5-9	5002-010	Cap, 220 PF, 500V, 20%	5	91418
C10	5002-011	Cap, .001 MF, 500V, 10%	1	91418
C11	BT .01	Cap, .01 MF, 100V, 20%	1	91418
C12	C281AB/A22K	Cap, .022 MF, 250V	1	73445
C13	C281CH/A470K	Cap, .47 MF, 100V	1	73445
C14	5002-011	Cap, .001 MF, 500V, 10%	1	91418
C15	STA684-1	Cap, 5.6 MF, 35V	1	12406
CR1-8	5003-002	Diode	8	03626
Q1-6	2N1305	Transistor	6	01295
Q7-22	2N3906	Transistor	16	04713
Q7-22	2N3638A/2N3702*	Transistor	16	04713
Q23-48	2N3904	Transistor	26	04713

THRESHOLD AND CLOCK ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q23-48	2N3565/2N3711	Transistor	26	04713
R1-3	RL07S152G	Res, 1/4W, 1.5K, 2%	3	
R4	RL07S103G	Res, 1/4W, 10K, 2%	1	
R5	RL07S163G	Res, 1/4W, 16K, 2%	1	
R6	RL07S183G	Res, 1/4W, 18K, 2%	1	
R7	RL07S223G	Res, 1/4W, 22K, 2%	1	
R8	RL07S273G	Res, 1/4W, 27K, 2%	1	
R9	RL07S753G	Res, 1/4W, 75K, 2%	1	
R10-11	RC07GF182J	Res, 1/4W, 1.8K, 5%	2	
R12-23	RC07GF222J	Res, 1/4W, 2.2K, 5%	12	
R24-26	RC07GF362J	Res, 1/4W, 3.6K, 5%	3	
R27-28	RC07GF392J	Res, 1/4W, 3.9K, 5%	2	
R29	RC07GF472J	Res, 1/4W, 4.7K, 5%	1	
R30	RC07GF682J	Res, 1/4W, 6.8K, 5%	1	
R31-32	RC07GF822J	Res, 1/4W, 8.2K, 5%	1	
R33-44	RC07GF103J	Res, 1/4W, 10K, 5%	12	
R45-48	RC07GF163J	Res, 1/4W, 16K, 5%	4	
R49	RC07GF203J	Res, 1/4W, 20K, 5%	1	
R50-53	RC07GF273J	Res, 1/4W, 27K, 5%	4	
R54	RC07GF753J	Res, 1/4W, 75K, 5%	1	

*Alternate

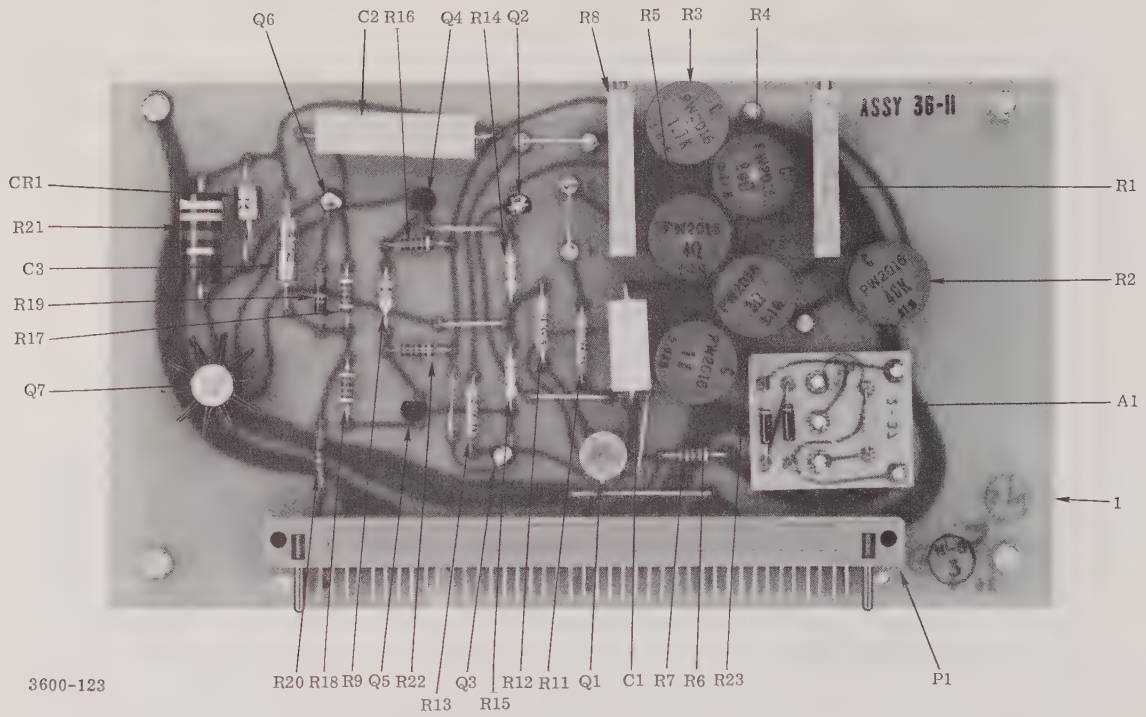


Figure 5-33. Reference Supply Assembly, 36-11

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Ref. Sup. Assy	36-11	Assy, Reference Supply		
1	36-10	PC S/A Reference Sup.	1	03626
P1	00-7023-041-000-001	Connector	1	91662
2	36-192	Shield, Circuit	1	03626
3	2006-32	Spacer, 3/16 LG	4	03626
4	TO-5	Cap, Plastic	1	01295
5	A10032	Transipad	3	07047
6	NF205	Heatsink	1	05820
A1	2-39	Assy, Zener	1	03626
C1	C281AB/A220K	Cap, 22 MF, 250V	1	73445
C2	C281AB/A1M	Cap, 1.0 MF, 250V	1	73445
C2	STA684-1	Cap, 5.6 MF, 35V	1	12406
CR1	1N3024A	Diode	1	04713
Q1	TP198A	Transistor, DJAL/NPN	1	20598
Q2	2N3904	Transistor, NPN	1	01295
Q3	2N3565	Transistor, NPN	1	01295
Q4	2N4052	Transistor, PNP	1	04713
Q5	MP5651B	Transistor, PNP	1	04713
Q6	2N3711	Transistor, NPN	1	01295

REFERENCE SUPPLY ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q7	2N697	Transistor, NPN	1	07910
R1	78P-R2K	Pot, 2K	2	80053
R2	PW2016C40001S	Res, 40K, 1%	1	03626
R3	PW2016CFSVK	Res, FSV, .03%	1	03626
R4, 5	PW2016CFSVX	Res, FSV, .10 OHM	1	03626
R6	PW2016C10000K	Res, 1.0K, .03%	1	03626
R7	RL07S621G	Res, 1/4W, 620 OHM, 2%	1	
R8	78P-R2K	Pot 2K	1	80053
R9	RL07S151G	Res, 1/4W, 1500 OHM, 2%	1	
R10	RL07SFVG	Res, 1/4W, FSV, 2%	1	
R11	RN60E3832F	Res, 1/8W, 38.3K, 1%	1	
R12	RN60E2152F	Res, 1/8W, 21.5K, 1%	1	
R13	RN60E3832F	Res, 1/8W, 38.3K, 1%	1	
R14-15	RC07GF123J	Res, 1/4W, 12K, 5%	2	
R16	RL075622G	Res, 1/4W, 6.2K, 2%	1	
R17-18	RL07S912G	Res, 1/4W, 9.1K, 2%	2	
R19	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R20	RC07GF201J	Res, 1/4W, 200 OHMS, 5%	1	
R21	RC07GF431J	Res, 2W, 430 OHM, 5%	1	
R22	RL07S622G	Res, 1/4W, 6.2K, 2%	1	
R23	PW2016CFSVX	Res, FSV, .1 OHM	1	03626

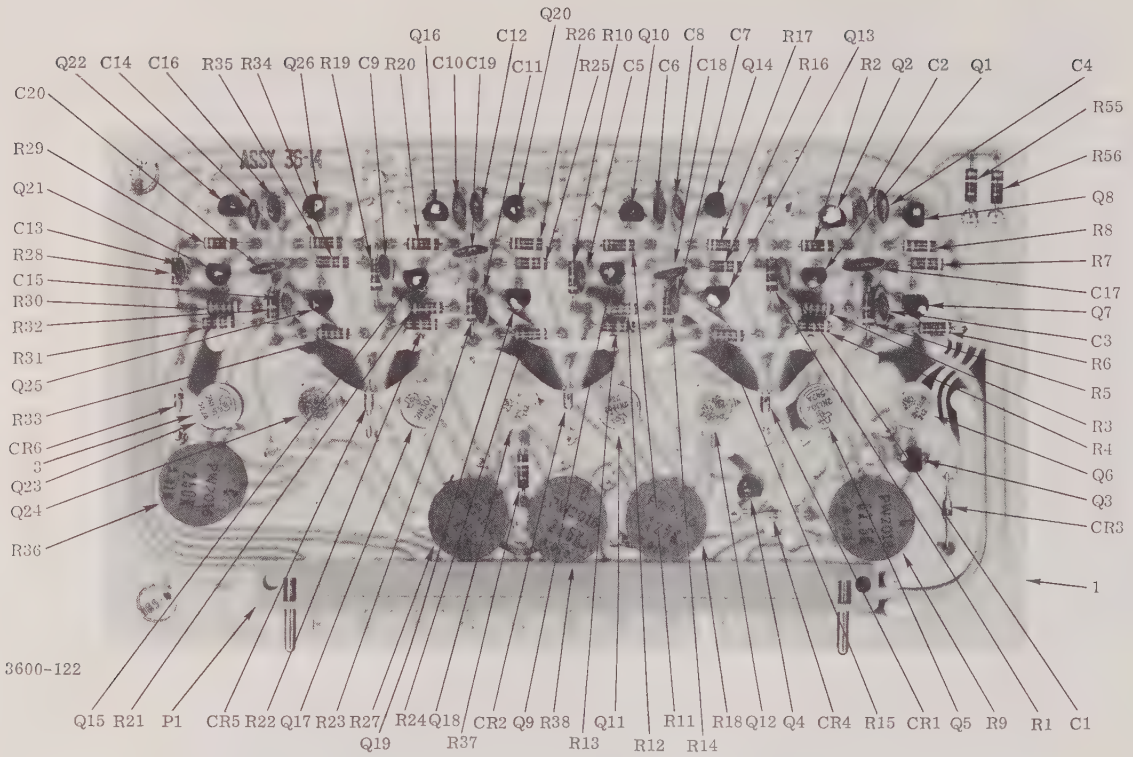


Figure 5-34. Decade (1-4) Assembly, 36-14

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Decade FF	36-14	Assy, Decade FF &		
1	36-13	PC S/A, Decade	1	03626
2	1002-35	Insulator	5	03626
3	A10032	Transipad	8	07047
4	TO5	Cap, Plastic	8	01295
P1	00-7023-41-000-001	Connector	1	91662
C1-16	5002-009	Cap, 220 PF, 500V	16	03626
C17-20	5002-010	Cap, .002 MF, 500V	4	03626
CR1-6	5003-002	Diode	6	03626
Q1-2	2N3906	Transistor	2	04713
Q1-2	2N3638A/2N3702*	Transistor	2	04713
Q3-4	2N3904	Transistor	2	04713
Q3-4	2N3565/2N3711*	Transistor	2	04713
Q5	2N1302	Transistor	1	01295
Q6	2N1305	Transistor	2	01295
Q7-8	2N3904	Transistor	2	04713
Q7-8	2N3565/2N3711	Transistor	2	04713
Q9-10	2N3906	Transistor	2	04713
Q9-10	2N3638A/2N3902*	Transistor	2	04713

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q11	2N1302	Transistor	1	01295
Q12	2N1305	Transistor	1	01295
Q13-14	2N3904	Transistor	2	04713
Q13-14	2N3565/2N3711*	Transistor	2	04713
Q15-16	2N3906	Transistor	2	04713
Q15-16	2N3638A/2N3702*	Transistor	2	04713
Q17	2N1302	Transistor	1	01295
Q18	2N1305	Transistor	1	01295
Q19-20	2N3904	Transistor	2	04713
Q19-20	2N3565/2N3711*	Transistor	2	04713
Q21-22	2N3906	Transistor	2	04713
Q21-22	2N3638A/2N3702*	Transistor	2	04713
Q23	2N1302	Transistor	1	01295
Q24	2N1305	Transistor	1	01295
Q25-26	2N3904	Transistor	2	04713
Q25-26	2N3565/2N3711*	Transistor	2	04713
R1	RL07S153G	Res, 1/4W, 15K, 2%	1	
R2	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R3	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R4-5	RL07S203G	Res, 1/4W, 20K, 2%	2	
R6	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R7	RL07S153G	Res, 1/4W, 15K, 2%	1	
R8	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R9	PW2016C62501F	Res, 62.5K, .01%	1	03626
R10	RL07S153G	Res, 1/4W, 15K, 2%	1	
R11	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R12	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R13-14	RL07S203G	Res, 1/4W, 20K, 2%	2	
R15	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R16	RL07S153G	Res, 1/4W, 15K, 2%	1	
R17	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R18	PW2016C12502F	Res, 125K, .01%	1	03626
R19	RL07S153G	Res, 1/4W, 15K, 2%	1	
R20	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R21	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R22-23	RL07S203G	Res, 1/4W, 20K, 2%	2	
R24	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R25	RL07S153G	Res, 1/4W, 15K, 2%	1	
R26	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R27	PW2016C12502F	Res, 125K, .01%	1	03626
R28	RL07S153G	Res, 1/4W, 15K, 2%	1	
R29	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R30	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R31-32	RL07S203G	Res, 1/4W, 20K, 2%	2	
R33	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R34	RL07S153G	Res, 1/4W, 15K, 2%	1	
R35	RC07GF432J	Res, 1/4W, 4.3K, 5%	1	
R36	PW2016C25002F	Res, 250K, .01%	1	03626
R37	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R38	PW2016C22502F	Res, 225K, .01%	1	03626
R55-56	RC07GF395J	Res, 1/4W, 3.9M, 5%	2	

*Alternate

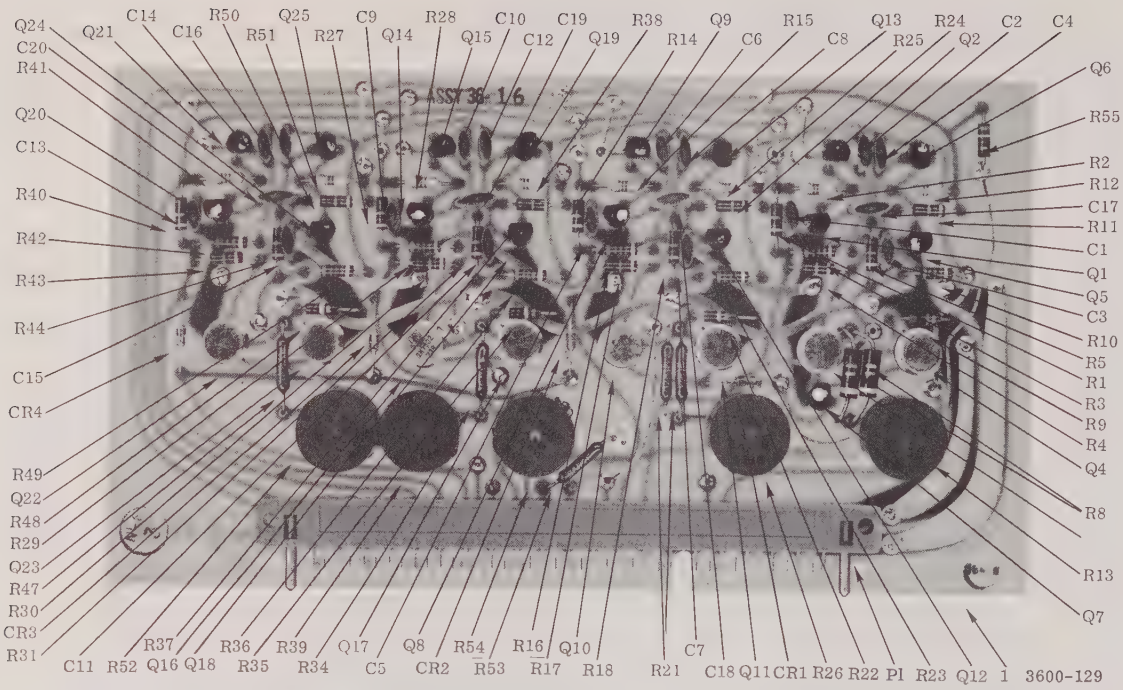


Figure 5-35. Decade (5) Assembly, 36-16

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Decade FF & Switches	36-16	Assy, Decade FF & Switches		
1	36-15	PC S/A, Decade	1	03626
2	TO5	Cap, Plastic	8	01295
3	A10032	Transipad	8	07047
P1	00-7023-41-000-001	Connector	1	91662
C1-16	5002-009	Cap, 220 PF, 500V	16	03626
C17-20	5002-010	Cap, .002 MF 500V	4	03626
CR1-4	5003-002	Diode	6	03626
Q1-2	2N3906	Transistor	2	04713
Q1-2	2N3638A/2N3702*	Transistor	2	04713
Q3	2N1302	Transistor	1	01295
Q4	2N1305	Transistor	1	01295
Q5-7	2N3904	Transistor	3	04713
Q5-7	2N3565/2N3711*	Transistor	3	04713
Q8-9	2N3906	Transistor	2	04713
Q8-9	2N3638A/2N3702*	Transistor	2	04713
Q10	2N1302	Transistor	1	01295
Q11	2N1305	Transistor	1	01295

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q12	2N3904	Transistor	1	04713
Q12-13	2N3565/2N3711*	Transistor	2	04713
Q14-15	2N3906	Transistor	2	04713
Q14-15	2N3638A/2N3702*	Transistor	2	04713
Q16	2N1302	Transistor	1	01295
Q17	2N1305	Transistor	1	01295
Q18-19	2N3904	Transistor	2	04713
Q18-19	2N3565/2N3711*	Transistor	2	04713
Q20-21	2N3906	Transistor	2	04713
Q20-21	2N3565/2N3711*	Transistor	2	04713
Q22	2N1302	Transistor	1	01295
Q23	2N1305	Transistor	1	01295
Q24-25	2N3904	Transistor	2	04713
Q24-25	2N3565/2N3711	Transistor	2	04713
R1	RL07S153G	Res, 1/4W, 15K, 2%	1	
R2	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R3	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R4-5	RL07S203G	Res, 1/4W, 20K, 2%	2	
R6	RN60DFSVF	Res, 1/4W, FSV, 1%	1	
R9	RC07GFFSVJ	Res, 1/4W, FSV, 5%	1	
R10	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R11	RL07S153G	Res, 1/4W, 15K, 2%	1	
R12	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R13	PW2016C62501F	Res, 62.5K, .01%	1	03626
R14	RL07S153G	Res, 1/4W, 15K, 2%	1	
R15	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R16	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R17-18	RL07S203G	Res, 1/4W, 20K, 2%	2	
R21	RN60DFSVF	Res, 1/4W, FSV, 1%	1	
R22	RC07GFFSVJ	Res, 1/4W, FSV, 5%	1	
R23	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R24	RL07S153G	Res, 1/4W, 15K, 2%	1	
R25	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R26	PW2016C62501F	Res, 62.5K, .01%	1	03626
R27	RL07S153G	Res, 1/4W, 15K, 2%	1	
R28	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R29	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R30-31	RL07S203G	Res, 1/4W, 20K, 2%	2	
R34	RN60DFSVF	Res, 1/4W, FSV, 1%	1	
R35	RC07GFFSVJ	Res, 1/4W, FSV, 5%	1	
R36	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R37	RL07S153G	Res, 1/4W, 15K, 2%	1	
R38	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R39	PW2016C12502F	Res, 125K, .01%	1	03626
R40	RL07S153G	Res, 1/4W, 15K, 2%	1	
R41	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R42	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R43-44	RL07S203G	Res, 1/4W, 20K, 2%	1	
R47	RN60DFSVF	Res, 1/4W, FSV, 1%	1	
R48	RC07GFFSVJ	Res, 1/4W, FSV, 5%	1	
R49	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R50	RL07S153G	Res, 1/4W, 15K, 2%	1	
R51	RL07GF432J	Res, 1/4W, 4.3K, 2%	1	
R52	PW2016C25002F	Res, 250K, .01%	1	03626
R53	RN60DFSVF	Res, 1/4W, FSV, 1%	1	
R54	PW2016C22502F	Res, 225K, .01%	1	03626
R55	RC07GF395J	Res, 1/4W, 3.9M, 5%	1	

*Alternate

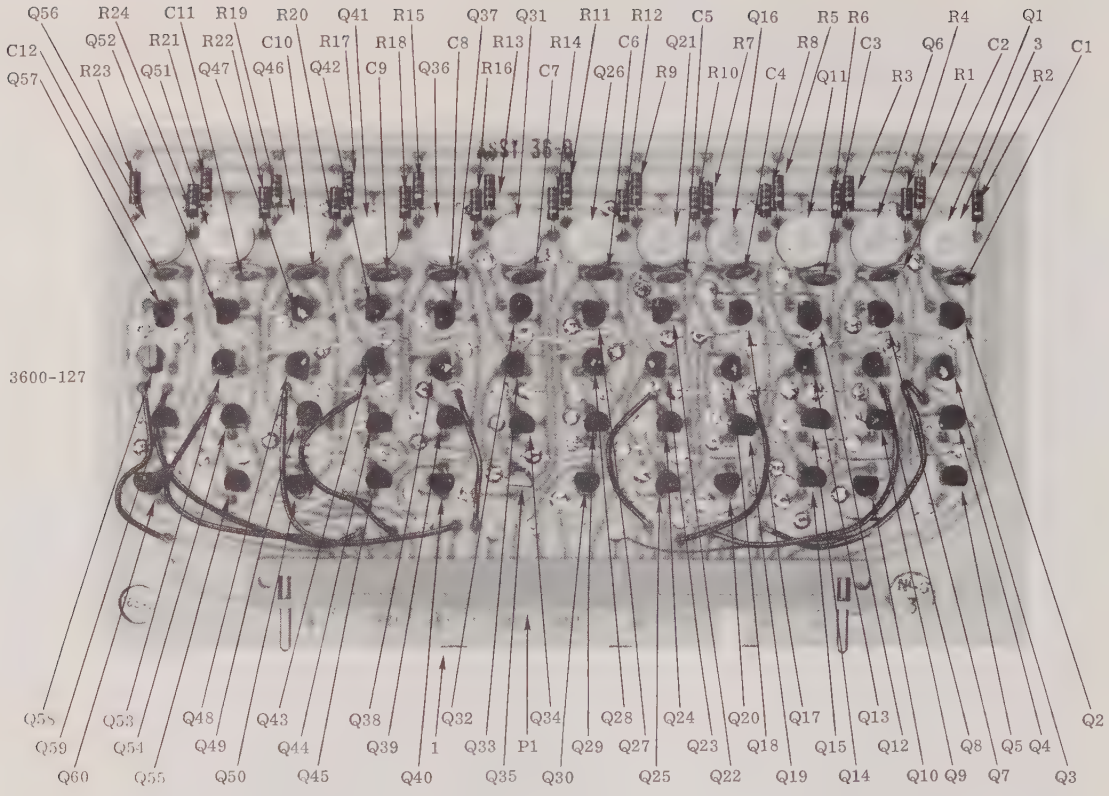


Figure 5-36. Decade Counter Assembly, 36-8

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Decade Counter	36-8	Assy, Decade Counter		
1	36-7	PC S/A, Decade Counter	1	03626
2	TO5	Cap, Plastic	12	01295
3	A10032	Transipad	12	07047
P1	00-7023-041-000-001	Connector	1	91662
C1-12	5002-009	Cap, 220 PF, 500V	12	91418
Q1	2N1305	Transistor	1	01295
Q2	2N3904	Transistor	1	01295
Q3	2N3906	Transistor	1	01295
Q4.5	2N3904	Transistor	2	01295
Q6	2N1305	Transistor	1	01295
Q7	2N3904	Transistor	1	01295
Q8	2N3906	Transistor	1	01295
Q9,10	2N3904	Transistor	2	01295
Q11	2N1305	Transistor	1	01295
Q12	2N3904	Transistor	1	01295
Q13	2N3906	Transistor	1	01295
Q14,15	2N3904	Transistor	2	01295
Q16	2N1305	Transistor	1	01295

DECADE COUNTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q16	2N1305	Transistor	1	01295
Q17	2N3904	Transistor	1	01295
Q18	2N3906	Transistor	1	01295
Q19,20	2N3904	Transistor	2	01295
Q21	2N1305	Transistor	1	01295
Q22	2N3904	Transistor	1	01295
Q23	2N3906	Transistor	1	01295
Q24,25	2N3904	Transistor	2	01295
Q26	2N1305	Transistor	1	01295
Q27	2N3904	Transistor	1	01295
Q28	2N3906	Transistor	1	01295
Q29,30	2N3904	Transistor	2	01295
Q31	2N1305	Transistor	1	01295
Q32	2N3904	Transistor	1	01295
Q33	2N3906	Transistor	1	01295
Q34,35	2N3904	Transistor	2	01295
Q36	2N1305	Transistor	1	01295
Q37	2N3904	Transistor	1	01295
Q38	2N3906	Transistor	1	01295
Q39,40	2N3904	Transistor	2	01295
Q41	2N1305	Transistor	1	01295
Q42	2N3904	Transistor	1	01295
Q43	2N3906	Transistor	1	01295
Q44,45	2N3904	Transistor	2	01295
Q46	2N1305	Transistor	1	01295
Q47	2N3904	Transistor	1	01295
Q48	2N3906	Transistor	1	01295
Q49,50	2N3904	Transistor	2	01295
Q51	2N1305	Transistor	1	01295
Q52	2N3904	Transistor	1	01295
Q53	2N3906	Transistor	1	01295
Q54,55	2N3904	Transistor	2	01295
Q56	2N1305	Transistor	1	01295
Q57	2N3904	Transistor	1	01295
Q58	2N3906	Transistor	1	01295
Q59,60	2N3904	Transistor	2	01295
R1-24	RL07S222J	Res, 1/4W, 2.2K, 5%	24	

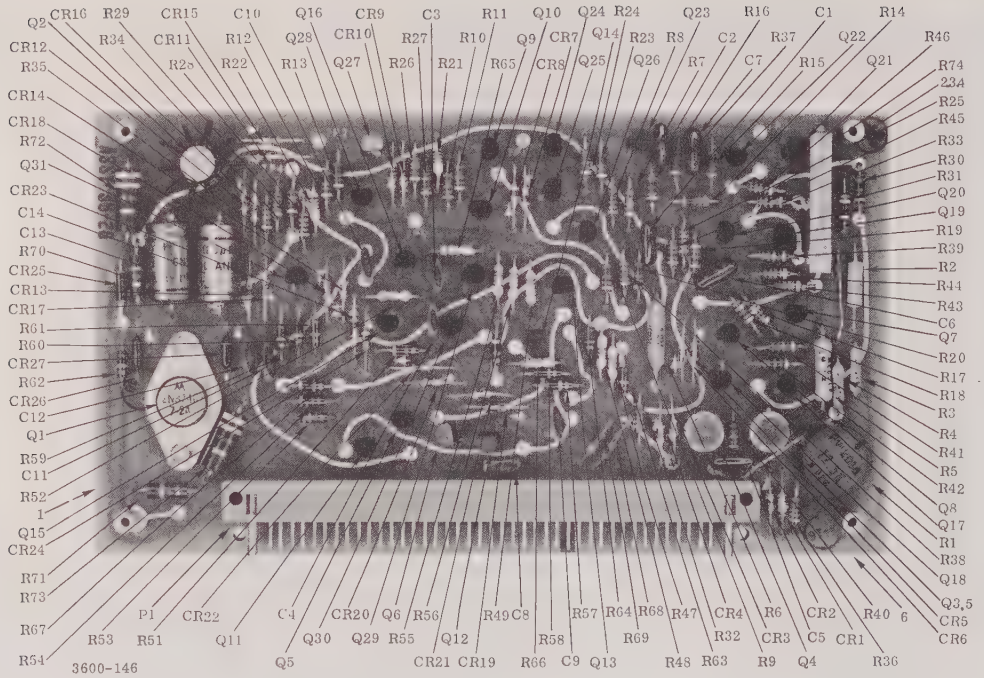


Figure 5-37. Comparator Assembly, 36-26

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Comparator	36-26	Assy, Comparator		
1	36-25	PC S/A Comparator	1	03626
2	36-192	Shield	2	03626
3	2006-32	Spacer, 3/16 Dia x 3/16 Lg	4	03626
4	2000-20	Standoff, 4-40 x 1/2 Lg	4	03626
5	TO5	Cap, Plastic	2	01295
6	NF205	Heat Sink	1	05820
7	A10031	Transipad	1	07047
P1	00-7023-041-000-001	Connector	1	03626
C1	DM15E050K	Cap, 5 PF, 500V, 10%	1	04062
C2	DM15E131G	Cap, 130 PF, 500V, 2%	1	04062
C3-4	5002-009	Cap, 220 PF, 500V, 20%	2	91418
C5	DM15E241G	Cap, 240 PF, 500V, 2%	1	04062
C6-7	DM15E391G	Cap, 390 PF, 500V, 2%	2	04062
C8-12	5002-012	Cap, 002 MF, 500V, 20%	5	03626
C13-14	C426AR/E125	Cap, 125 MF, 16V	2	10013
CR1-24	5003-002	Diode	24	03626
CR25	1N725A	Diode, Zener	1	01295
CR26-27	1N961B	Diode, Zener	2	04713

COMPARATOR ASSY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q1	2N3710	Transistor	1	04713
Q1	2N3711	Transistor	1	04713
Q2	2N697	Transistor	1	04713
Q3-4	TP198A	Transistor	2	20598
Q5-6	2N3611	Transistor	2	04713
Q5-6	2N3906/SK7431/ 2N3615	Transistor	2	04713
Q7-10	2N1062	Transistor	1	04713
Q11-16	2N3906	Transistor	6	04713
Q11-16	2N3638A/2N3702*	Transistor	6	04713
Q17-31	2N3904	Transistor	15	04713
Q17-31	2N3565/2N3711	Transistor	15	04713
R1	PW2016C12501F	Res, 12.5K, .01%	1	03626
R2	RN60EFSV2F	Res, 1/8W, FSV, 1%, (10K, 21.5K, 38.3K)	1	
R3-4	RN60E3013F	Res, 1/8W, 301K, 1%	2	
R5	RN65E1004F	Res, 1/8W, 1M, 1%	1	
R6	RN65D1214F	Res, 1/2W, 1.21M, 1%	1	
R7-13	RL07S151G	Res, 1/4W, 150 ohm, 2%	7	
R14-16	RL07S301G	Res, 1/4W, 300 ohm, 2%	3	
R17-18	RL07S391G	Res, 1/4W, 390 ohm, 2%	2	
R19	RL07S911G	Res, 1/4W, 910 ohm, 2%	1	
R20	RL07S102G	Res, 1/4, 1K, 2%	1	
R21-22	RL07S112G	Res, 1/4W, 1.1K, 2%	2	
R23-24	RL07S272G	Res, 1/4W, 1.5K, 2%	2	
R25-29	RL07S302G	Res, 1/4W, 2.7K, 2%	5	
R30	RL07S302G	Res, 1/4W, 3K, 2%	1	
R31	RL07S392G	Res, 1/4W, 3.9K, 2%	1	
R32-35	RL07S512G	Res, 1/4W, 5.1K, 2%	4	
R36-38	RL07S822G	Res, 1/4W, 8.2K, 2%	3	
R39	RL07S133G	Res, 1/4W, 13K, 2%	1	
R40-42	RL07S223G	Res, 1/4W, 22K, 2%	3	
R43-46	RL07S273G	Res, 1/4W, 27K, 2%	4	
R47-48	RC07GF471J	Res, 1/4W, 470 ohm, 5%	2	
R49	RC07GF162J	Res, 1/4W, 1.6K, 5%	1	
R50-51	RC07GF302J	Res, 1/4W, 3K, 5%	2	
R52	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R53-54	RC07GF432J	Res, 1/4W, 4.3K, 5%	2	
R55-56	RC07GF512J	Res, 1/4W, 5.1K, 5%	2	
R57-62	RC07GF103J	Res, 1/4W, 10K, 5%	2	
R63-64	RC07GF153J	Res, 1/4W, 15K, 5%	2	
R65-66	RC07GF183J	Res, 1/4W, 18K, 5%	2	
R67	RC07GF303J	Res, 1/4W, 30K, 5%	1	
R68-69	RC07GF106J	Res, 1/4W, 10M, 5%	2	
R70-71	RC20GF182J	Res, 1/2W, 1.8K, 5%	2	
R72-73	RC20GF471J	Res, 1W, 470 ohm, 5%	2	
R74	78P-R20K	Pot, 20K	1	

*Alternate

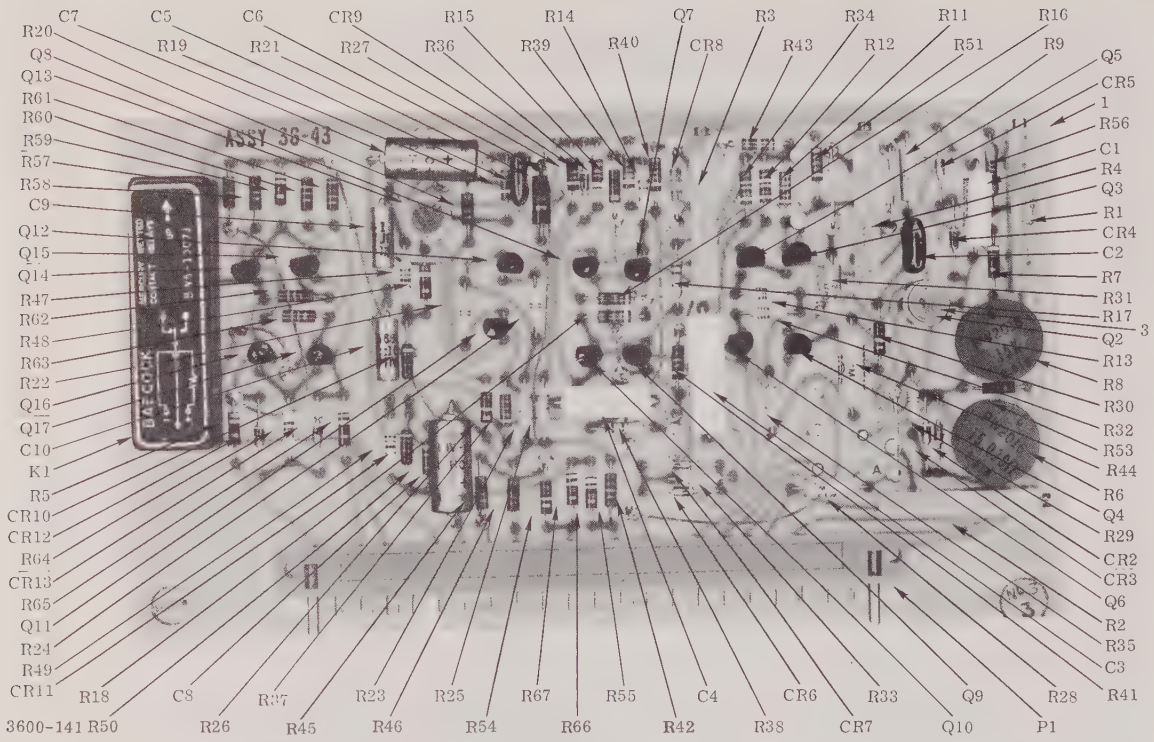


Figure 5-38. Inverter Assembly, 36-43

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Inverter	36-43	Assy, Inverter		
1	36-42	PC S/A, Inverter	1	03626
2	TO5	Cap, Plastic	2	01295
3	A10032	Transipad	1	07047
P1	00-7023-041-000-001	Connector	1	91662
C1	C281CH/B10K	Cap, .01 MF, 400V	1	73445
C1	PD1X103*	Cap, .01 MF, 100V	1	73445
C2	DM15E241G	Cap, 240 PF, 500V	1	73445
C2	DM15E241F/*	Cap, 240 PF, 100V	1	73445
	CD7F241G300*	Cap, 240 PF, 300V	1	73445
C3	C281AB/A330K	Cap, .33 MF, 250V	1	73445
C3	ZX2X334K*/210B1C334K* 210BK334K*	Cap, .33 MF, 200V	1	73445
C4	C281AB/A150K	Cap, .15 MF, 250V	1	73445
C5	CM15E131G	Cap, 130 PF, 500V	1	73445
C5	DM15E131F*	Cap, 130 PF, 100V	1	73445
	CD7F151G500*	Cap, 130 PF, 500V	1	73445
C6	BT-01	Cap, .01 MF, 100V	1	91418
C7-8	C426AR/H20	20 MF, 50V	1	73445

INVERTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
C9-10	STA684-1	Cap, 5.6 MF, 35V	1	12406
CR2-7	5003-002	Diode	6	03626
CR8	1N774A	Diode	1	03626
CR9	5003-002	Diode	1	03626
CR10-11	1N961B	Diode	2	03626
CR12-13	5003-002	Diode	2	03626
K1	BW5-1007J	Relay	1	09026
Q2	TP198A	Transistor	1	20598
Q3-6	2N3707	Transistor	4	01295
Q7-10	2N3702	Transistor	4	04713
Q7-10	2N3638A*	Transistor	4	04713
Q11-12	2N3711	Transistor	2	07910
Q11-12	2N3565*	Transistor	2	07910
Q13	2N697	Transistor	1	04713
Q14-15	SK7431	Transistor	2	01295
Q14-15	2N3645*	Transistor	2	01295
Q16-17	2N3711	Transistor	2	01295
Q16-17	2N3565*	Transistor	2	01295
R1	78P-R200	Pot, 200 ohm	1	80053
R2	78P-R20K	Pot, 20K	1	80053
R3	78P-R2K	Pot, 2K	1	80053
R4	78P-R20K	Pot, 20K	1	80053
R5	RC07GF392J	Res, 1/4W, 3.9K, 5%	1	01121
R6	PW2016C15021F	Res, 15,020 ohm, .01%	1	03626
R7	RC07GF472J	Res, 1/4W, 4.7K, 5%	1	01121
R8	PW2016C15001F	Res, 15K, 1%	1	03626
R9	RN60E3013F	Res, 1/8W, 301K, 1%	1	
R10	RN60E1002F	Res, 1/8W, 10K, 1%, FSV	1	
R11	RL07S123G	Res, 1/4W, 12K, 2%	1	
R12	RL07S242G	Res, 1/4W, 24K, 2%	1	
R13	RL07S511G	Res, 1/4W, 510 ohm, 2%	1	
R14	RC07GF513J	Res, 1/4W, 51K, 5%	1	
R15	RC07GF202J	Res, 1/4W, 2K, 5%	1	
R16	RL07S101G	Res, 1/4W, 100 ohm, 2%	1	
R17	RC07GF513J	Res, 1/4W, 51K, 5%	1	
R18	RL07S101G	Res, 1/4W, 100 ohm, 2%	1	
R19	RL07SA73G	Res, 1/4W, 47K, 2%	1	
R20	RC07GF101J	Res, 1/4W, 100 ohm, 5%	1	
R21	RC20GF202J	Res, 1/2W, 2K, 5%	1	
R22	RL07S391G	Res, 1/4W, 390 ohm, 2%	1	
R23	RL07S273G	Res, 1/4W, 27K, 2%	1	
R24	RL07S391G	Res, 1/4W, 390 ohm, 2%	1	
R25	RL07S213G	Res, 1/4W, 27K, 2%	1	
R26	RC07GF153J	Res, 1/4W, 15K, 5%	1	
R27	RL07S202G	Res, 1/4W, 2K, 2%	1	
R28	RN60D1004F	Res, 1/4W, 1M, 1%	1	
R29	RL07S752G	Res, 1/4W, 7.5K, 2%	1	
R30	RC07GF223J	Res, 1/4W, 22K, 5%	1	
R31	RN60E3013F	Res, 1/8W, 301K, 1%	1	
R32	RL07S511G	Res, 1/4W, 510 ohm, 2%	1	

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
R33	RC07GF132J	Res, 1/4W, 1.3K, 5%	1	
R34	RL07S243G	Res, 1/4W, 24K, 2%	1	
R35	RL07S273G	Res, 1/4W, 27K, 2%	1	
R36	RL07S472G	Res, 1/4W, 4.7K, 2%	1	
R37	RL07S562G	Res, 1/4W, 5.6K, 2%	1	
R38	RC07GF131J	Res, 1/4W, 130 ohm, 5%	1	
R39	RL07S122G	Res, 1/4W, 1.2K, 2%	1	
R40	RL07S152G	Res, 1/4W, 1.5K, 2%	1	
R41	RL07S513G	Res, 1/4W, 51K, 2%	1	
R42	RL07S273G	Res, 1/4W, 27K, 2%	1	
R43	RL07S104G	Res, 1/4W, 100K, 2%	1	
R44	RN65E1004F	Res, 1/4W, 1M, 1%	1	
R45-46	RC07GF101J	Res, 1/4W, 100 ohm, 5%	2	
R47	RC07GF510J	Res, 1/4W, 51 ohm, 5%	1	
R48	RC07GF272J	Res, 1/4W, 2.7K, 5%	1	
R49	RC07GF510J	Res, 1/4W, 51 ohm, 5%	1	
R50	RC07GF332J	Res, 1/4W, 3.3K, 5%	1	
R51	RL07S822G	Res, 1/4W, 8.2K, 2%	1	
R53	RC07GF105J	Res, 1/4W, 10M, 5%	1	
R54-55	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R56	RN60D27R4F	Res, 1/4W, 27.4 ohm, 1%	1	
R57	RC07GF363J	Res, 1/4W, 36K, 5%	1	
R58	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R59	RC07GF471J	Res, 1/4W, 470 ohm, 5%	1	
R60	RC076F243J	Res, 1/4W, 24K, 5%	1	
R61	RC07GF363J	Res, 1/4W, 36K, 5%	1	
R62-63	RC07GF243J	Res, 1/4W, 24K, 5%	1	
R64	RC076F301J	Res, 1/4W, 300 ohm, 5%	1	
R65	RC07GF392J	Res, 1/4W, 3.9K, 5%	1	
R66-67	RC07GF471J	Res, 1/4W, 470 ohm, 5%	1	

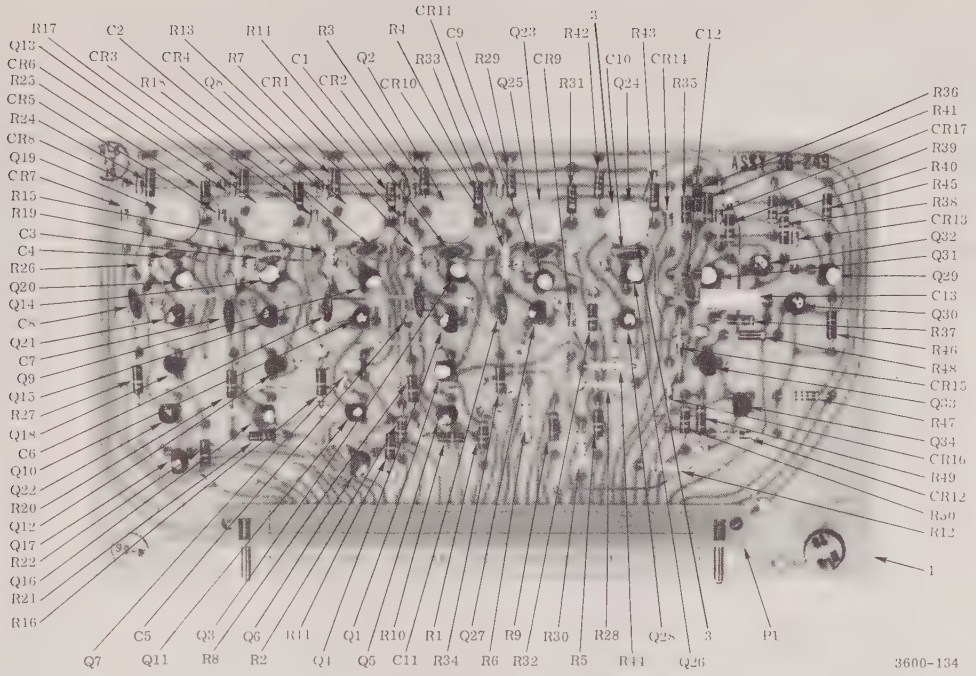


Figure 5-39. Program Counter Assembly, 36-249

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Program Counter	36-249	Assy, Program Counter		
1	36-60	PC S/A, Program Counter	1	03626
2	TO5	Cap, Plastic	6	03626
3	A10032	Transipad	6	07047
P1	00-7023-041-000-001	Connector	1	91662
C1-4	5002-009	Cap, 220 PF, 500V	4	91418
C5-8	5002-010	Cap, .002 MF, 500V	4	91418
C9-10	5002-009	Cap, 220 PF, 500V	2	91418
C11-12	5002-010	Cap, .002 MF, 500V	4	91418
C13	C281AB/A47K	Cap, .047 MF, 100V	1	12406
CR1-17	NLS5003-002	Diode	17	03626
Q1	2N3904/2N3711	Transistor	1	04713
Q2	2N1305	Transistor	1	01295
Q3	2N3904/2N3711	Transistor	1	04713
Q4-6	2N3906/2N3638A/2N3702	Transistor	3	04713
Q7	2N3904/2N3711	Transistor	1	04713
Q8	2N1305	Transistor	1	01295

PROGRAM COUNTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Q9	2N3904/2N3711	Transistor	1	04713
Q10-11	2N3906/2N3638A/ 2N3702	Transistor	2	04713
Q12	2N3904/2N3711	Transistor	1	04713
Q13	2N1305	Transistor	1	01295
Q14	2N3904/2N3711	Transistor	1	04713
Q15-17	2N3906/2N3638A/ 2N3702	Transistor	2	04713
Q18	2N3904/2N3711	Transistor	1	04713
Q19	2N1305	Transistor	1	01295
Q20	2N3904/2N3711	Transistor	1	04713
Q21-22	2N3906/2N3638A/ 2N3702	Transistor	2	04713
		Transistor	2	04713
Q23-24	2N1305	Transistor	2	01295
Q25-26	2N3904/2N3711	Transistor	2	04713
Q27-28	2N3906/2N3638A/ 2N3702	Transistor	2	04713
Q29	2N3904/2N3711	Transistor	1	04713
Q30	2N3906/2N3638A/ 2N3702	Transistor	1	04713
Q31-32	2N3904/2N3711	Transistor	2	04713
Q33-34	2N3906/2N3638A/ 2N3702	Transistor	2	04713
R1-2	RC07GF363J	Res, 1/4W, 36K, 5%	2	
R3-4	RC07GF222J	Res, 1/4W, 2.2K, 5%	2	
R5	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R6	RC07GF123J	Res, 1/4W, 12K, 5%	1	
R7	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R8	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R9	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R10-11	RC07GF104J	Res, 1/4W, 100K, 5%	2	
R12	RC07GF622J	Res, 1/4W, 6.2K, 5%	1	
R13-14	RC07GF222J	Res, 1/4W, 2.2K, 5%	2	
R15	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R16	RC07GF104J	Res, 1/4W, 100K, 5%	2	
R17-18	RC07GF222J	Res, 1/4W, 2.2K, 5%	2	
R19	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R20-22	RC07GF104J	Res, 1/4W, 100K, 5%	3	
R24-25	RC07GF222J	Res, 1/4W, 2.2K, 5%	2	
R26	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R27	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R28	RC07GF622J	Res, 1/4W, 6.2K, 5%	1	
R29	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R30	RC07GF123J	Res, 1/4W, 12K, 5%	1	
R31	RC07GF222J	Res, 1/4W, 2.2K, 5%	1	
R32	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R33	RC07GF362J	Res, 1/4W, 3.6K, 5%	1	
R34	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R35	RC07GF203J	Res, 1/4W, 20K, 5%	1	
R36	RC07GF623J	Res, 1/4W, 62K, 5%	1	

PROGRAM COUNTER ASSEMBLY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
R37	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R38	RC07GF134J	Res, 1/4W, 130K, 5%	1	
R39-40	RC07GF103J	Res, 1/4W, 10K, 5%	2	
R41	RC07GF202J	Res, 1/4W, 2K, 5%	1	
R42-43	RC07GF222J	Res, 1/4W, 2.2K, 5%	2	
R44	RC07GF123J	Res, 1/4W, 12K, 5%	1	
R45	RC07GF103J	Res, 1/4W, 10K, 5%	1	
R46	RC07GF133J	Res, 1/4W, 13K, 5%	1	
R47	RC07GF393J	Res, 1/4W, 39K, 5%	1	
R48	RC07GF202J	Res, 1/4W, 2K, 5%	1	
R49	RC07GF302J	Res, 1/4W, 3K, 5%	1	
R50	RC07GF363J	Res, 1/4W, 36K, 5%	1	

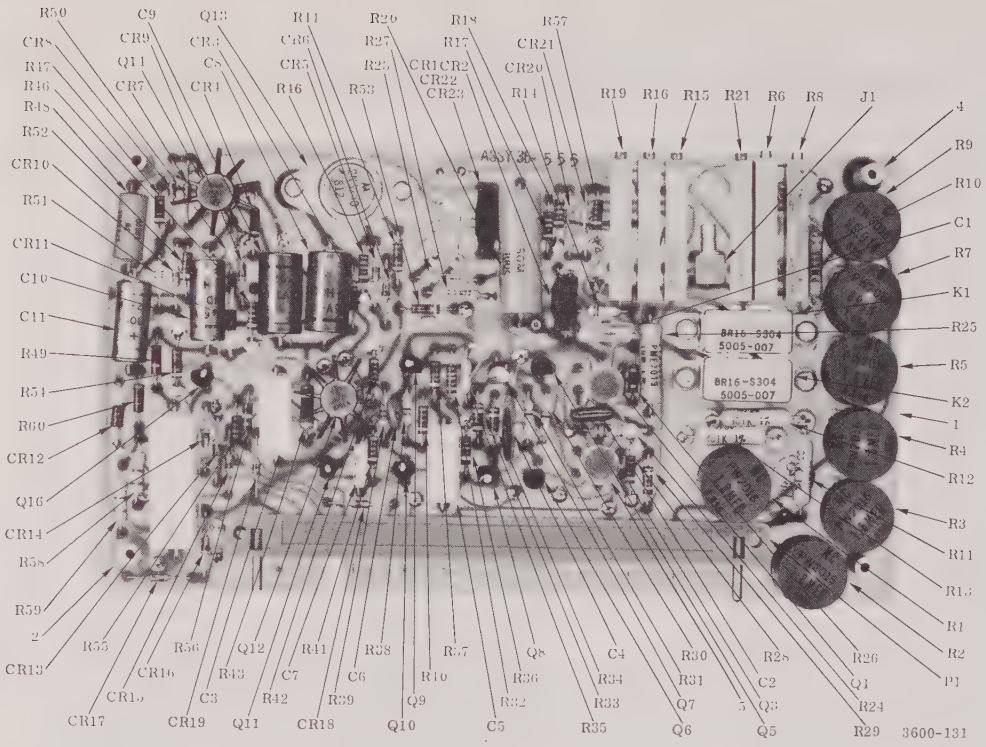


Figure 5-40. Buffer Assembly, 36-555

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
Buffer	36-555	Assy, Buffer		
1	36-554	PC S/A, Buffer	1	03626
J1	1116/188	Connector	1	15558
P1	00-7023-041-000-001	Connector	1	91662
2	NF205	Heat Sink	2	05820
3	36-729	Shield Assy	1	03626
4	2006-32	Spacer	4	03626
5	A10032	Transipad	2	07047
C1	CY15C511J	Cap, 510 PF, 500V, 5%	1	16299
C1	VY03CA511J*	Cap,	1	95275
C2	DM-15E500J	Cap, 50 PF, 500V, 5%	1	02799
C3	C281AB/B220K	Cap, .22 MF, 250V, 10%	1	91418
C4	5002-012	Cap, .0033 MF, 500V, 10%	1	91418
C5	C281AB/B220K	Cap, .22 MF, 250V, 5%	1	73445
C6	DD-391	Cap, 390 PF, 1 KV, 10%	1	71590
C7	210B1C222	Cap, .0022 MF, 200V, 5%	1	14752
C8-9	C426AR/E125	Cap, 125 MF, 16V, +50%, -10%	2	73445
C10-11	C426AR/H20	Cap, 20 MF, 64V, +50%, -10%	2	73445
C12	C281AB/B1M	Cap, 1 MF, 250V, 5%	1	73445

BUFFER ASSY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
CR1-2	1N458	Diode, Opaque, Non-light Sensitive	2	01295
CR3-4	1N961B	Diode, Zener	2	04713
CR5-10	5003-002	Diode	6	03626
CR11-12	M4Z14A	Diode, Zener, 14V, ±5%	2	18641
CR13-19	5003-002	Diode	7	03626
CR20-21	1N774A	Diode	2	03626
CR22-23	1N458	Diode, Opaque, Non-light Sensitive	2	01295
K1-2	5005-007	Relay	2	03626
Q1	TP198A	Transistor	1	20598
Q3	TP198A	Transistor	1	20598
Q5-6	2N3707	Transistor	2	01295
Q7-8	MPS6518	Transistor	2	04713
Q7-8	2N4062*	Transistor	2	04713
Q9-11	2N3904	Transistor	3	04713
Q9-11	2N3565*	Transistor	3	04713
Q9-11	2N3711*	Transistor	3	04713
Q12	2N1711	Transistor	1	07263
Q13	2N3741	Transistor	1	04713
Q14	2N697	Transistor	1	04713
Q16	2N3643	Transistor	1	07213
Q16	SK6501*	Transistor	1	07213
R1-5	PW2016NC18003M	Res, 1.8M, .05%	5	03626
R6	78P-R2K	Pot, 2K	1	80053
R7	PW2016NC89902M	Res, 899K, .05%	1	03626
R8	78P-R200	Pot, 200 ohm	1	80053
R9	PW2016C99911M	Res, 99.91K, .05%	1	03626
R10	RN65D8063F	Res, 1/4W, 806K, 1%	1	35009
R11-13	RN65D/MEBTO	Res, 1/4W, 301K, 1%	3	35009
R14	RL07S104G	Res, 1/4W, 100K, 2%	1	75402
R15	78P-R200K	Pot, 200K	1	80053
R16	78P-R500	Pot, 500 ohm	1	80053
R17-18	RL07S133G	Res, 1/4W, 13K, 2%	2	75402
R19	78P-R500	Pot, 500 ohm	1	80053
R20	RN75B/MDF	Res, 1W, 50M, 2%	1	35009
R20	PT1000*	Res,	1	03888
R21	78P-R200K	Pot, 200K	1	80053
R22	RN65C1003F	Res, 1/4W, 100K, 1%	1	35009
R22	PME65215KT2*	Res		03888
R23	PME60T-2	Res, 1/8W, 3.5M, 1%	1	03888
R24	RL20S224G	Res, 1/2W, 220K, 2%	1	
R25	PME70T-9,10M	Res, 1/2W, 10M, 1%	1	03888
R26	RC07GFFSVJ	Res, 1/4W, 2.7K, 3K, 3.3K, 3.6K, 3.9K or 4.3K (FSV), 5%	1	01121
R27	PME60T-2	Res, 1/8W, 3.5M, 1%	1	03888
R28	RL07S512G	Res, 1/4W, 5.1K, 2%	3	
R29	RL07S392G	Res, 1/4W, 3.9K, 2%	1	
R30-31	RC07GF204J	Res, 1/4W, 200K, 5%	2	
R32	RL07S183G	Res, 1/4W, 18K, 2%	2	
R33-34	RL07S391G	Res, 1/4W, 390 ohm, 2%	2	
R35	RL07S752G	Res, 1/4W, 7.5K, 2%	1	
R36	RL07S183G	Res, 1/4W, 18K, 2%	1	
R37	RL07S152G	Res, 1/4W, 1.5K, 2%	1	
R38-39	RL07S391G	Res, 1/4W, 390 ohm, 2%	2	
R40	RL07S362G	Res, 1/4W, 3.6K, 2%	1	
R41-42	RL07S822G	Res, 1/4W, 8.2K, 2%	2	
R43	RL20S390G	Res, 1/2W, 30 ohm, 2%	1	

BUFFER ASSY (Continued)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY PER ASSY.	MANUFACTURER'S CODE
R44	RL07S620G	Res, 1/4W, 62 ohm, 2%	1	
R45-46	RL07S183G	Res, 1/4W, 18K, 2%	2	
R47	RL07S620G	Res, 1/4W, 62 ohm, 2%	1	
R48	450E3025	Res, 3W, 3K, 5%	1	80183
R49	RC07GF100J	Res, 1/4W, 10 ohm, 5%	1	
R50-51	RL07S512G	Res, 1/4W, 5.1K, 2%	2	
R52	RL07S102G	Res, 1/4W, 1K, 2%	1	
R53-54	RL07S620G	Res, 1/4W, 62 ohm, 2%	1	
R55	RC07GF163J	Res, 1/4W, 16K, 5%	1	
R56	RC07GF104J	Res, 1/4W, 100K, 5%	1	
R57	RL07S562G	Res, 1/4W, 5.6K, 2%	1	
R58-59	RC20GF431J	Res, 1/2W, 430 ohm, 5%	1	
R60	RC07GF303J	Res, 1/4W, 30K, 5%	1	

*Alternate

CHAPTER VI

RECOMMENDED SPARE PARTS LIST

PART NO.	DESCRIPTION	QUANTITY
36-8	Decade Counter Assembly	1
36-11	Reference Assembly	1
36-14	Decade (1-4) Assembly	1
36-16	Decade (5) Assembly	1
36-26	Comparator Assembly	1
36-43	Inverter Assembly	1
36-67	Decode Assembly	1
36-73	Threshold and Clock Assembly	1
36-179	Transfer Board No. 1 Assembly (DVM P/N's 36-646 & 36-758 only)	1
36-185	Transfer Board No. 3 Assembly (DVM P/N's 36-646, 36-758, & 36-874 only)	1
36-249	Program Counter Assembly	1
36-266	Regulator Assembly	1
36-269	Polarity Flip-Flop Assembly	1
36-272	Range Counter Assembly	1
36-275	Scan Counter Assembly (DVM P/N's 36-646, 36-758, 36-759 & 36-894 only)	1
36-296	Filter Assembly	1
36-320	Range Limit Logic Assembly	1
36-324	Range Decision Assembly	1
36-409	Transfer Board No. 1 Assembly (DVM P/N 36-874 only)	1
36-413	Transfer Board No. 2 Assembly (DVM P/N 36-874 only)	1
36-485	Rectifier & Power Relay Assembly (DVM P/N's 36-758, 36-759 36-786 & 36-874 only)	1
36-488	Transfer Board No. 2 Assembly (DVM P/N's 36-646 & 36-758 only)	1
36-494	Scan Control Assembly (DVM P/N's 36-771 & 36-786 only)	1
36-495	Rectifier Assembly (DVM P/N's 36-646 & 36-771 only)	1
36-555	Buffer Assembly	1
36-563	Transfer Board No. 1 Assembly (DVM P/N 36-759 only)	1
36-564	Transfer Board No. 2 Assembly (DVM P/N 36-759 only)	1
36-836	Transfer Board No. 3 Assembly (DVM P/N 36-759 only)	1
1N4720	Diode	1
4-10-59	Readout Module (Decade)	1
4-10-98	Readout Module (Polarity and Over-range)	1
4-19-1	Bulb, Lamp	12
313001	Fuse, 3AG1A Slo-Blo	10
WHISPER	Fan, Rotron	1
1009-41	Extension Board	1
D-224	Transformer	1
500-1034-01	Capacitor, 6000 MFD, 20V	1
500-1058-01	Capacitor, 1900 MFD, 50V	1
500-1074-01	Capacitor, 725 MFD, 100V	1

APPENDIX

SHIPPING INSTRUCTIONS

Depending upon location, the choice of carrier will vary. Never ship an instrument to us without having received shipping instructions. If requested, an estimate of charges can be made before work begins.

Be certain to pack the instrument carefully; while an outer and inner box, separated by two or three inches of excelsior is desirable, the instrument can be placed into a single container provided it is so packed that it will not shift about. As with the double box method, use two or three inches of shock-absorbent packing materials. The instrument itself should be first wrapped in heavy paper so as to keep excelsior or other particles from entering the instrument's louvers. If the original shipping container is in good condition, it may be used.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it does not operate or is damaged, a claim should be made with the carrier. The claim agent should receive a full report of damage, and this report sent to Non-Linear Systems, Inc. After receiving such a report we will advise you of the disposition of the instrument and arrange for its repair or replacement. Be certain to include model and serial number when corresponding.

GLOSSARY

FUNCTION DESIGNATIONS ON SCHEMATIC DIAGRAMS

Decade Counter Assembly - 36-8

(D) (CL2) - Down signal and clock pulse
$CL1_2$ - Clock pulse
$CL2_1$ - Clock pulse
Z DECS - Zero decades
(D) (CL1) - Down signal and clock pulse
$CL1_1$ - Clock pulse
Z 5-4 - Zero the 4 bit in the 5th Decade (Typical)
S 5-4* - Set the 4* bit in the 5th Decade (Typical)
$CL2_2$ - Clock pulse

Comparator Assembly - 36-26

(D) CL1 - Down signal and clock pulse
(D) CL2 - Down signal and clock pulse
D. A. C. - Digital-to-analog converter

Inverter Assembly - 36-43

L = MINUS - Low signal is minus polarity
L = PLUS - Low signal is plus polarity

Decode Assembly - 36-67

L = 1 - Low signal = 1 bit
H = 1 - High signal = 1 bit
L = 2• 2* (4*) - Low signal = 2 & 2* bit (1-4 decades) and 2 & 4* bit in 5th decade
H = 2• 4 - High signal = 2 & 4 bit

Threshold and Clock Assembly - 36-73

D-CL2 - Down signal and clock pulse
$CL2_2$ - Clock pulse
$DL2_1$ - Clock pulse
$D\text{-}CL_1$ - Down signal and clock pulse
$CL1_2$ - Clock pulse
$CL1_1$ - Clock pulse
CL_3 - Clock pulse
CL_2 - Clock pulse
CL_1 - Clock pulse

L = UP - Low signal = up pulse
L = DN - Low signal = down pulse
H = DN - High signal = down pulse
$\overline{L}$ = ENCODE - Low signal = not encode
L = ENCODE - Low signal = encode

Transfer Relay Assembly #1 - 36-179

D4-8 - Decade 4, numeral 8 (Typical)
P. S. G. - Power supply ground
C. C. - Contact closure

Transfer Relay Assembly #2 - 36-182

D4-8 - Decade 4, numeral 8 (Typical)
B. C. D. -4 - Binary numeral 4 (Typical)

Program Counter Assembly - 36-249

CL_P - Clock pulse to program counter

Regulator Assembly - 36-266

P. S. G. - Power supply ground

Polarity Flip-Flop Logic Assembly - 36-269

PC_7 - Program counter state 7
L = CHANGE POLARITY - Low signal = polarity change
PC_3 - Program counter state 3
H = RATIO - High signal = ratio
CL_3 - Clock pulse
L = PC_3 - Signal is low with program counter in state 3

Range Counter Assembly - 36-272

CL_P - Clock pulse to program counter
H = UP RANGE - High signal is up range pulse
H = DN RANGE - High signal is down range pulse

Scan Counter Assembly - 36-275

CL_P - Clock pulse to program counter
H = AUTO RANGE - High signal = auto range
L = RANGE UP - Low signal = up range pulse

L = 1000V RANGE - Low signal = 1000V range
L = RANGE DN - Low signal = down range pulse
L = 10V RANGE - Low signal = 10V range

Range Limit Logic Assembly - 36-320

H = LOWER LIMIT RANGE - High signal = lower limit range
H = UPPER LIMIT RANGE - High signal = upper limit range
H = RANGE UP - High signal = up range pulse
H = RANGE DOWN - High signal = down range pulse
L = RANGE UP - Low signal = up range pulse
L = PC_3 - Signal is low with program counter in state 3
L = DOWN RANGE - Low signal = down range pulse

Range Decision Logic Assembly - 36-324

L = $(2 \cdot 4^*)_5$ - Low signal = 2 & 4* bit in 5th decade
L = $(1)_5$ - Low signal = 1 bit in 5th decade
H = DN = High signal = down pulse
L = 0_3 - Have low signal with number zero lighted in 3rd decade
L = 0_2 - Have low signal with number zero lighted in 2nd decade
L = 0_1 - Have low signal with number zero lighted in 1st decade
L = 0_4 - Have low signal with number zero lighted in 4th decade
H = $(2 \cdot 4)_5$ - Have high signal with 2 & 4 bit in 5th decade
H = $(1)_5$ - Have high signal with 1 bit in 5th decade
L = CHANGE POL. - Low signal = Polarity change
L = 9_4 - Have low signal with number nine lighted in 4th decade
L = 9_3 - Have low signal with number nine lighted in 3rd decade
L = 9_2 - Have low signal with number nine lighted in 2nd decade
L = 9_1 - Have low signal with number nine lighted in 1st decade
L = RANGE DN - Low signal = Down range pulse
L = RANGE UP - Low signal = Up range pulse
CL_3 - Clock Pulse

Scan Control Assembly - 36-494

S. S. - Single scan
H = AUTO RANGE - High signal = auto range
L = RANGE UP - Low signal = up range pulse
L = 1000V RANGE - Low signal = 1000V range relay enable
L = RANGE DOWN - Low signal = down range pulse
L = 10V RANGE - Low signal = 10V range relay enable
L = CHANGE POL. - Low signal = change polarity
H = AUTO POL. - High signal = auto polarity
INT. - Internal trigger
PC_3 SET ENABLE - Program counter state 3 = set enable
PC_2 - Program counter state 2

SUPPLEMENTAL DATA I

USING THE SERIES X-1 DVM WITH A HEWLETT-PACKARD 562A DIGITAL RECORDER

1. For operation with the Series X-1 DVM, the Hewlett-Packard Recorder should be procured with options 22 (plug-in boards) and 30 (cable).

2. Modify the Recorder as follows:

   a. Add a jumper from the +16-volt supply to pin 1 and from the -9-volt supply to pin 2 of the 6-pin output connector nearest the center of the Power Supply Board (A16).

   b. Change resistor R4 on the Control Board (A13) from 1000 ohms to 500 ohms.

   c. Connect the black 6-pin connector socket No. 2 of the Power Supply Board connector which is nearest to the center of the board (see the recorder instruction manual for location of boards, pins, components, etc.).

3. For recorder operation, connect the recorder cable to connector J4 of the X-1 DVM.

4. If the recorder is to control the triggering of the X-1 (closed-loop operation), jumper pin 45 to pin 47 and pin 48 to pin 50 of connector J3 of the X-1 DVM.

REVISIONS				
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE / APPROVED
	D	S/N-15 & ON	REDRAWN; PINS 37 & 38 WERE GND, "ENCODE" WAS "START"	6-7-66 HTS / Hoffman
A18	E	IN 135 ASSY	ADDED NOTE 6. 8-10-66 DN	8-11-66 / Knight

NOTES UNLESS OTHERWISE SPECIFIED!

1. ALL RESISTORS ARE 1/4W 5%.
2. ALL PNP TRANSISTORS ARE 2N3906/2N3638A/2N3702.
3. ALL NPN TRANSISTORS ARE 2N5904/2N3545/2N3711
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A1A8 YA1A9.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO.	
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN	D. DC 12-2-65
	CHECK	T. LAM 3-31-66
	APPR	R. HOFHEIMER 4-8-66
	RELEASE DATE	4-8-66
MATERIAL		

36-205 NEXT ASSY.	36-205 FINAL ASSY.	2 NEXT ASSY.	2 FINAL ASSY
APPLICATION		QTY.	

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

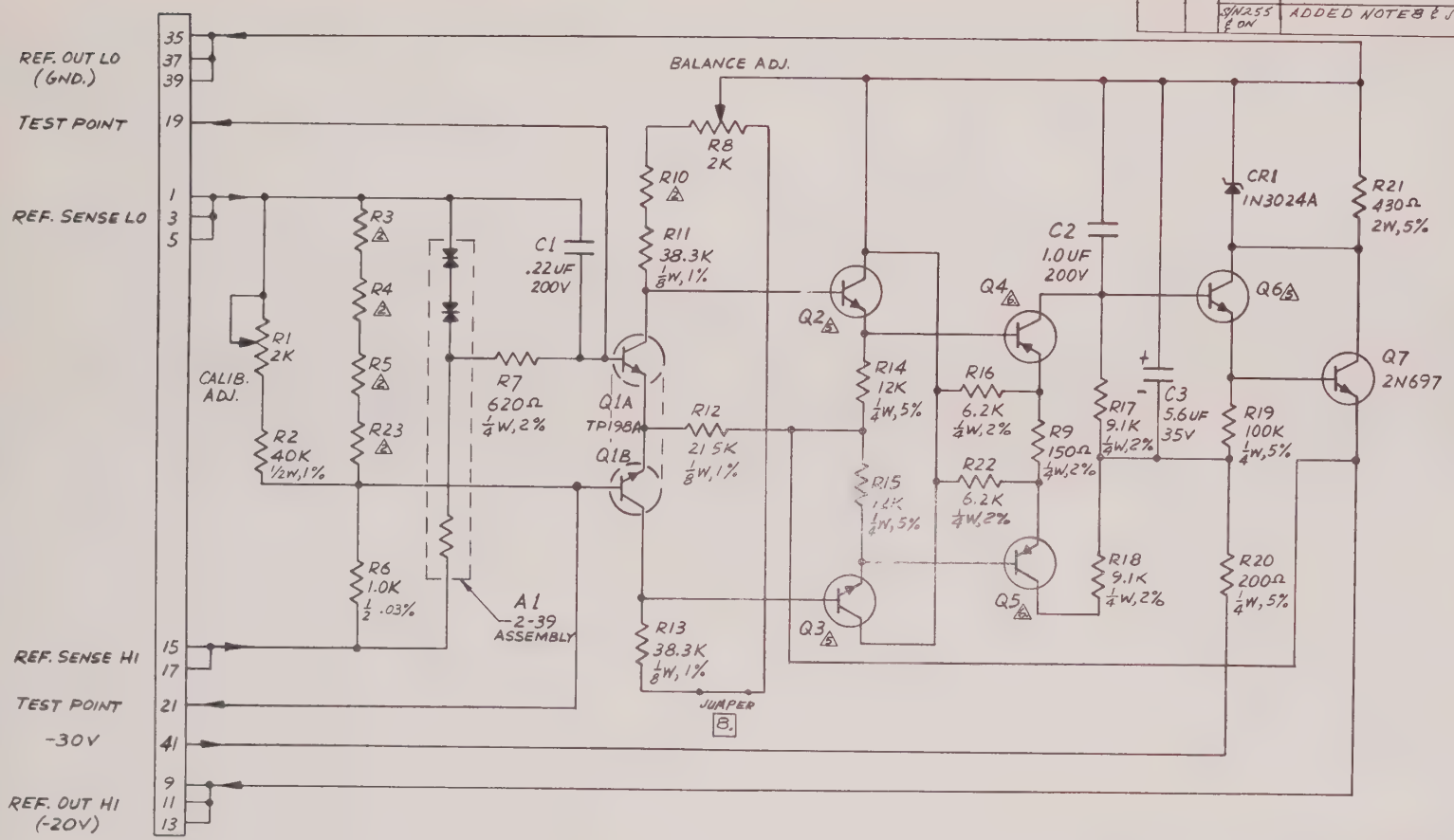
SCHEMATIC
DECADE COUNTER
SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-8
SCALE NONE	WEIGHT	SHEET 2 OF 2

36-8 E

REVISIONS					
SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
F		S/N.115 & ON	ADDED NOTE 9	8-2-66	8-2-66 R.T.W.
G		S/N.116 & ON	INC E.O.1 OF CHG 'F' -YD	9-12-66	9-12-66 R.T.W.

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	C	S/N.1 & ON	REDRAWN WAS REV. 2.	5-3-66 HBM	Hoffheimer
F/D	D	S/N.15 & ON	CHG'D.: R7, R9, R16, R17, R18 & R22 FROM ⅛W, TO ¼W. 6-16-66 DH.	6/20/66	Hoffheimer
F/D	E	S/N.15 & ON	INCORP E.O.1 of CHG. D, & ADDED NOTE 7 DH.	8-10-66	L. Knopf
		S/N255 & ON	ADDED NOTE 8 & JUMPER	9/1/66	R. Warner



QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

2. R2-6 & R23 ARE PWR2016 C
8. ALTERNATE LOCATION FOR R10. REF. 36-11 SHT 1 NOTE Δ4
7. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A3A6.
Δ6. 2N3906, 2N3638A, MPS6518, 2N3702.
Δ5. 2N3904, 2N3711, 2N3565
4. DOCUMENT 719 GIVES INSTRUCTION FOR ADJUSTING R1.
3. DOCUMENT 715 GIVES INSTRUCTION FOR ADJUSTING R8.
Δ2. RESISTORS R3, 4, 5, 10 & 23 ARE SELECTED, SEE DOC. 715.
1. RESISTORS ARE ⅛W, 2%.
NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
36-208	36-205	1	1
36-203	36-204	1	1
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO.

DRAWN	H. BRINLEY	5-2-66
CHECK		5-4-66
APPR	Hoffheimer	5-9-66

RELEASE DATE 5-4-66 ④

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC, REFERENCE SUPPLY

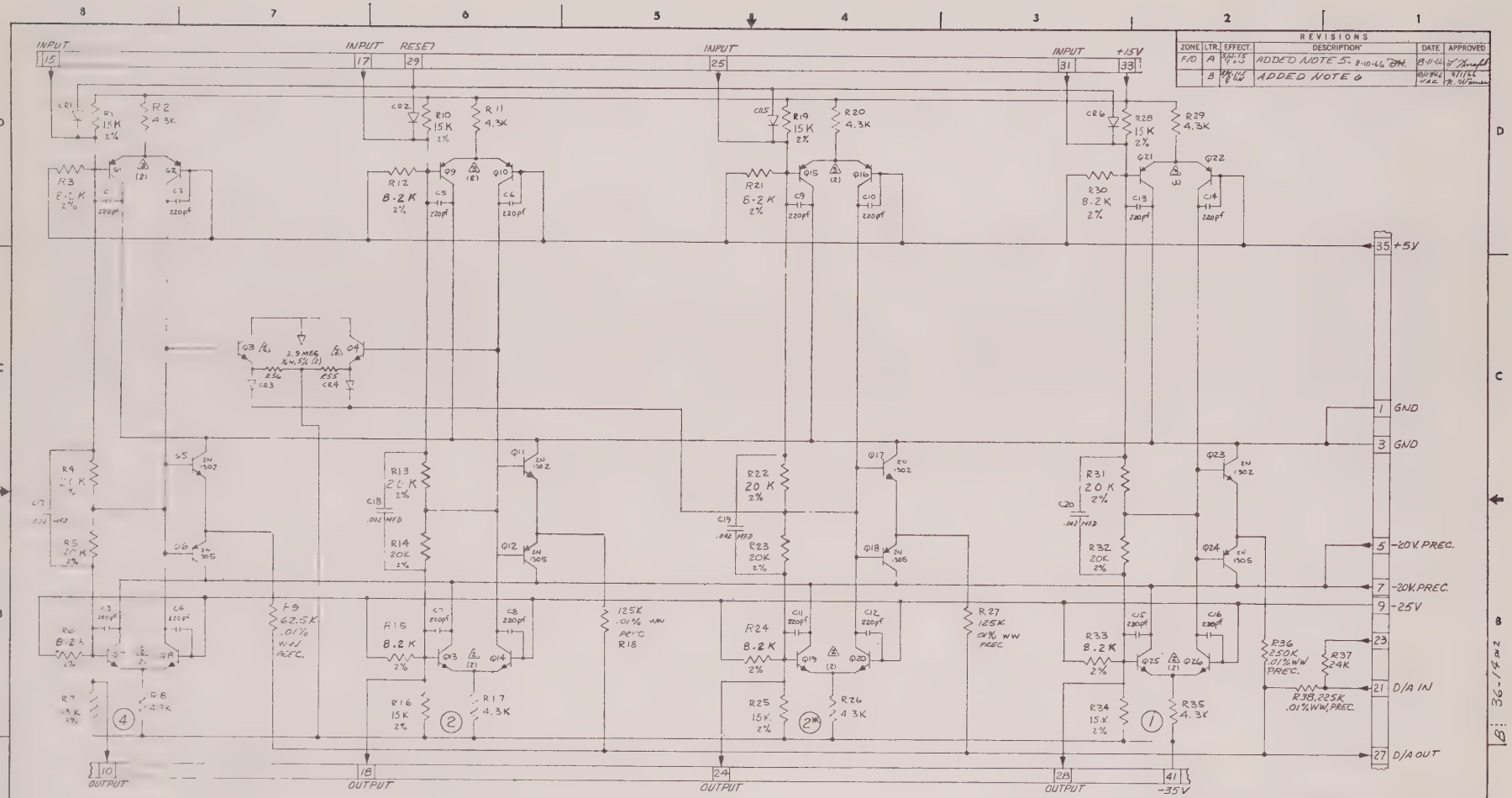
SERIES X-1

SIZE	CODE IDENT NO.	
C	03626	36-11

SCALE | WEIGHT | SHEET 2 OF 2

36-11 SH 2

6/66 DIETERICH-POST CLEARPRINT 10004-10



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION*	DATE	APPROVED
F/D	A	SN 115 & ON	ADDED NOTE 5. 8-10-66 DH.	8-11-66	J. Knight
	B	SN 115 & ON	ADDED NOTE 6	8/19/66 VAC	9/11/66 R. Warner

A INSULATION RESISTANCE BETWEEN PIN 39 & PIN 41 SHOULD BE 200,000 MEGOHMS MINIMUM WITH THE MEGOHMMETER SET AT 50V.

2N3906 / 2N3638A / 2N3702

2N3904 / 2N3565 / 2N3711

1. *ALL RESISTORS ARE ¼W 5% UNLESS OTHERWISE SPECIFIED.

6. R9, 18, 27, 38, & 36 ARE PW2016.

5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A1A10 THRU A1A13.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.
		PARTS LIST			

EFFECT SN 115 & ON

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO.
DRAWN HOFHEINZ 7-3-65
CHECK T Kern 4-19-66
APPR Hyltenius 7/11/66
RELEASE DATE 7-11-66

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

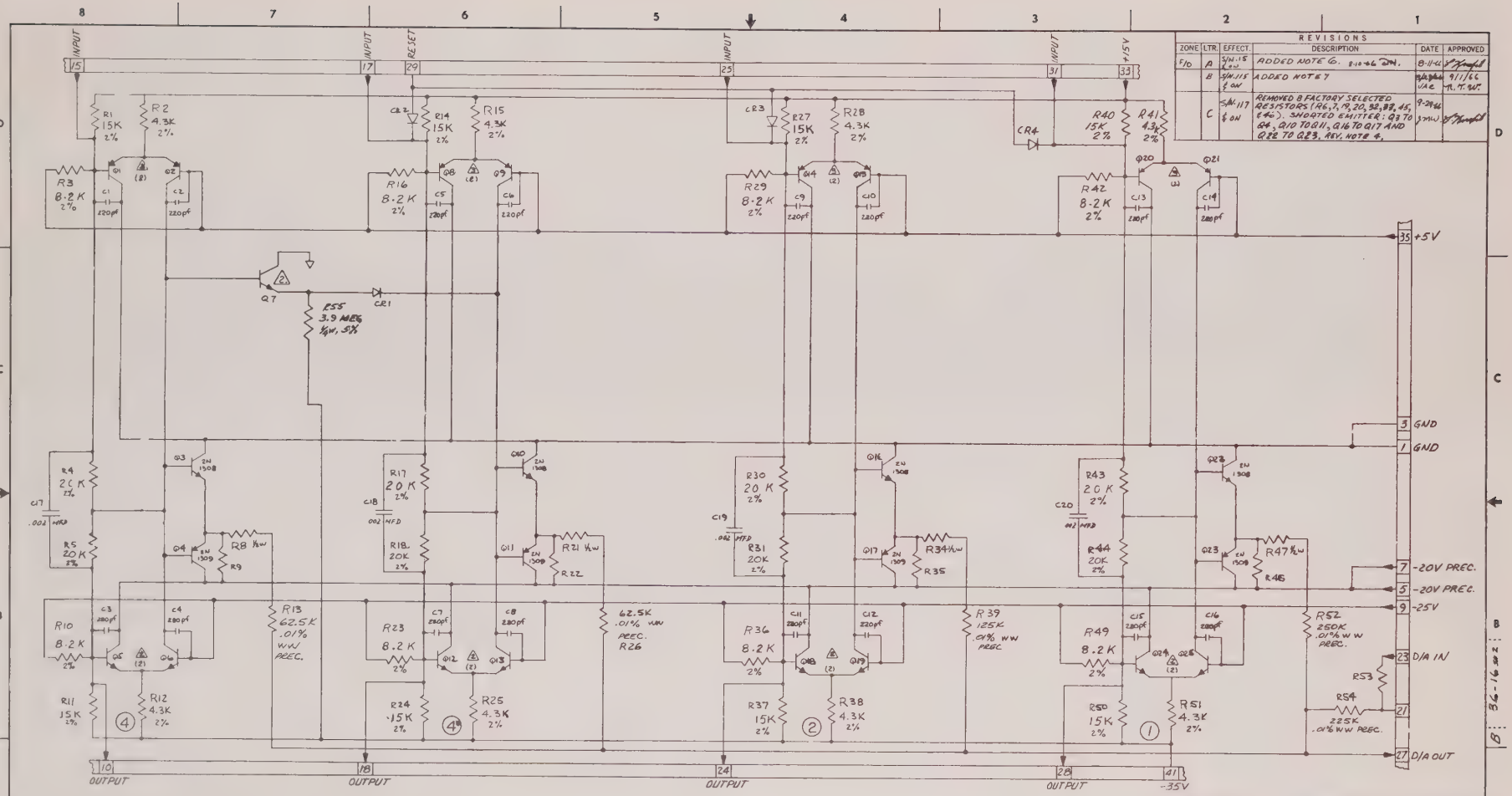
DECADE FLIP-FLOPS AND SWITCHES
DECADES 1-4 SERIES X-1.

SIZE D | CODE IDENT NO. 03626 | 36-14
SCALE | WEIGHT | SHEET 2 of 2

36-205	36-205	4	4
NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY.
APPLICATION		QTY.	

NOT [illegible] UNLESS OTHERWISE SPECIFIED

36-14 rev 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
F/O	A	S/N 15 & ON	ADDED NOTE 6. 8-10-66 DH.	8-11-66	
	B	S/N 115 & ON	ADDED NOTE 7	9/1/66	
	C	S/N 117 & ON	REMOVED B FACTORY SELECTED RESISTORS (R6,7,19,20,32,33,45, 46). SHORTED EMITTER: Q3 TO Q4, Q10 TO Q11, Q16 TO Q17 AND Q22 TO Q23, REV. NOTE 4.	9-2-66	

5. INSULATION RESISTANCE BETWEEN PIN 33 & PIN 41 SHOULD BE 200,000 MEGOHMS MINIMUM WITH THE MEGOHMMETER SET AT 50V.

4 REFER TO NLS DOC. NO 779 FOR THE SELECTION OF TRANSISTORS Q3,4,10,11,16,17,22 & 23 AND TO DETERMINE THE VALUES OF RESISTORS R 8-9, 21-22, 34-35, 47-48, & 53.

△ 2N 3906/ 2N 3638A/ 2N 3702

△ 2N 3904/ 2N 3646/ 2N 3711

1. ALL RESISTORS ARE ¼W 5% CARBON COMP.

7. R13, 26, 39, 52, & 54 ARE PWR 0.1% & C

6. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A1A14.

NOTES: UNLESS OTHERWISE SPECIFIED

EFFEC. S/N 15 & ON

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32

CONTR. NO.
DRAWN HOFHEINER 7-3-65
CHECK T. Kan 4-19-66
APPR Hoffheiner 7-11-66
RELEASE DATE 7-11-66

MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

DECADE FLIP-FLOPS AND SWITCHES DECADE 5

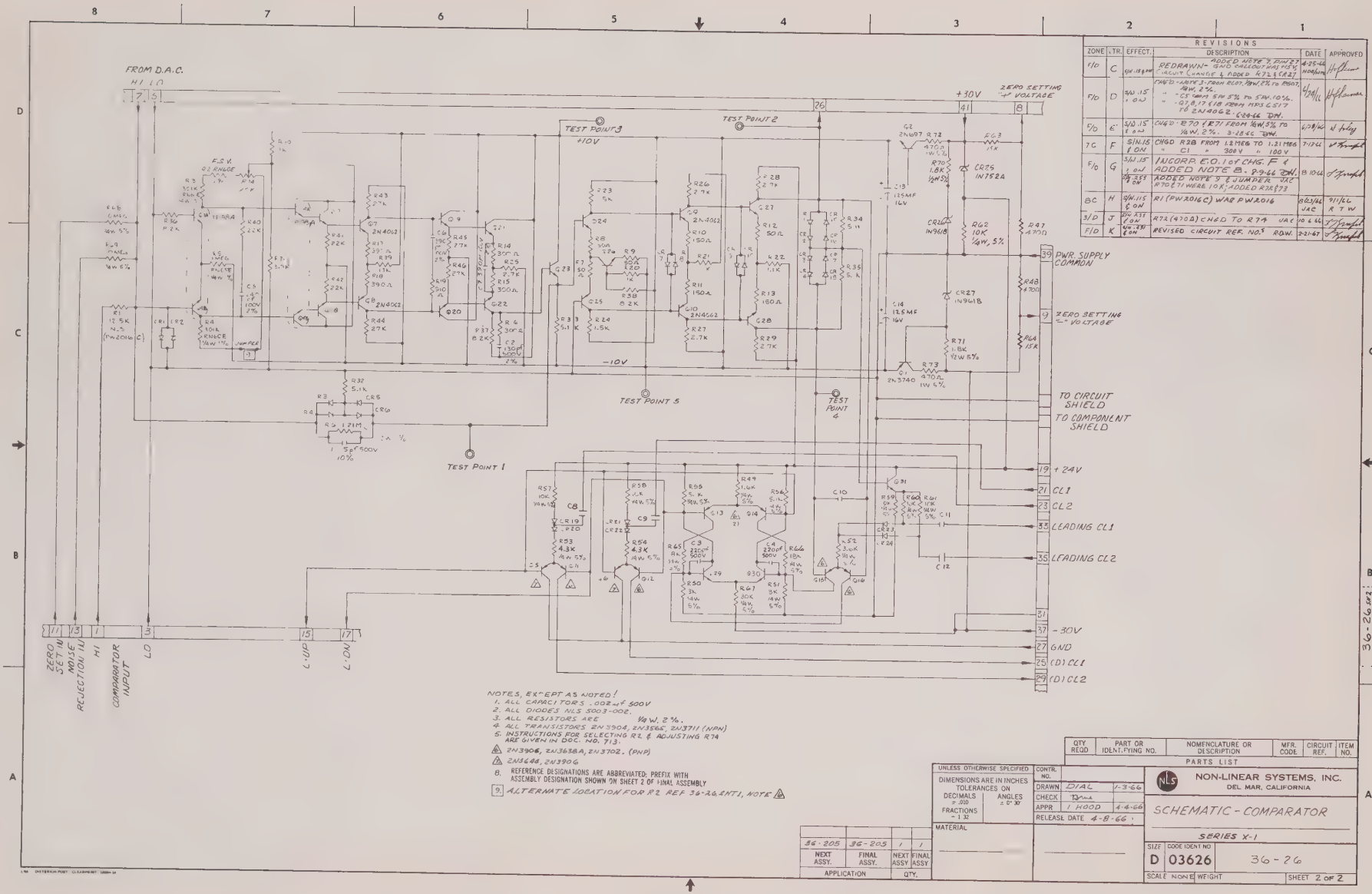
SERIES X-1

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
36-205	36-205	1	1

APPLICATION QTY.

SIZE	CODE IDENT NO	
D	03626	36-16

SCALE WEIGHT SHEET 2 of 2



NOTES, EXCEPT AS NOTED!
1. ALL CAPACITORS .002 μf 500V
2. ALL DIODES IN 5003-002.
3. ALL RESISTORS ARE ½ W, 2%.
4. ALL TRANSISTORS 2N3904, 2N3565, 2N3711 (NPN)
5. INSTRUCTIONS FOR SELECTING R2 & ADJUSTING R74 ARE GIVEN IN DOC. NO. 713.
6. 2N3906, 2N3638A, 2N3702. (PNP)
7. 2N3646, 2N3906
8. REFERENCE DESIGNATIONS ARE ABBREVIATED- PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY
9. ALTERNATE LOCATION FOR R2 REF 36-26 ENTI, NOTE 6

REVISIONS

ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
1/0	C	SN 118 on	REDRAWN - ADDED NOTE 7, DWG 27 CIRCUIT CHANGE & ADDED R72 & CR27 GND CALLOUT WAS 15 V	4-25-66 NORDAHL	Hoffman
F/0	D	SNO 115 & ON	CHGD - NOTE 3 FROM BLDY, ½W 2% TO ¼W, 2%. " "CT" FROM 5W 5% TO 5W 10%. " "Q7, 8, 17 & 18 FROM MPS 6517 TO 2N4062. 6-28-66 DM.	6/28/66	Hoffman
F/0	E	SNO 115 & ON	CHGD R70 (R71 FROM ½W 5% TO ¼W, 2%. 8-28-66 DM.	6/28/66	W Tilley
7C	F	SN 115 & ON	CHGD R28 FROM 1.2 MEG TO 1.21 MEG " C1 = 300V " 100V	7-12-66	W Tilley
F/0	G	SN 115 & ON SN 253 & ON	INCORP. E.O. 107 CHG. F & ADDED NOTE 8. P-9-66 DM. ADDED NOTE 9 & JUMPER J6-7 R70 & 71 WERE 10K; ADDED R74 & 73	8-10-66	J Tilley
BC	H	SN 115 & ON	R1 (PW 2016C) WAS PW 2016	8-24-66 JAC	9-11-66 R T W
3/D	J	SN 253 & ON SN 438 & ON	R72 (470Ω) CHGD TO R74 JAC	10-6-66	J Tilley
F/D	K		REVISED CIRCUIT REF. NO.S R.D.W.	2-21-67	J Tilley

QTY. REQD	PART OR IDENT. FYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

36-205 NEXT ASSY.	36-205 FINAL ASSY.	1 NEXT ASSY	1 FINAL ASSY
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

MATERIAL

CONTR. NO.		
DRAWN	DIAL	1-3-66
CHECK	Dame	
APPR	I HOOD	4-4-66
RELEASE DATE	4-8-66	

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

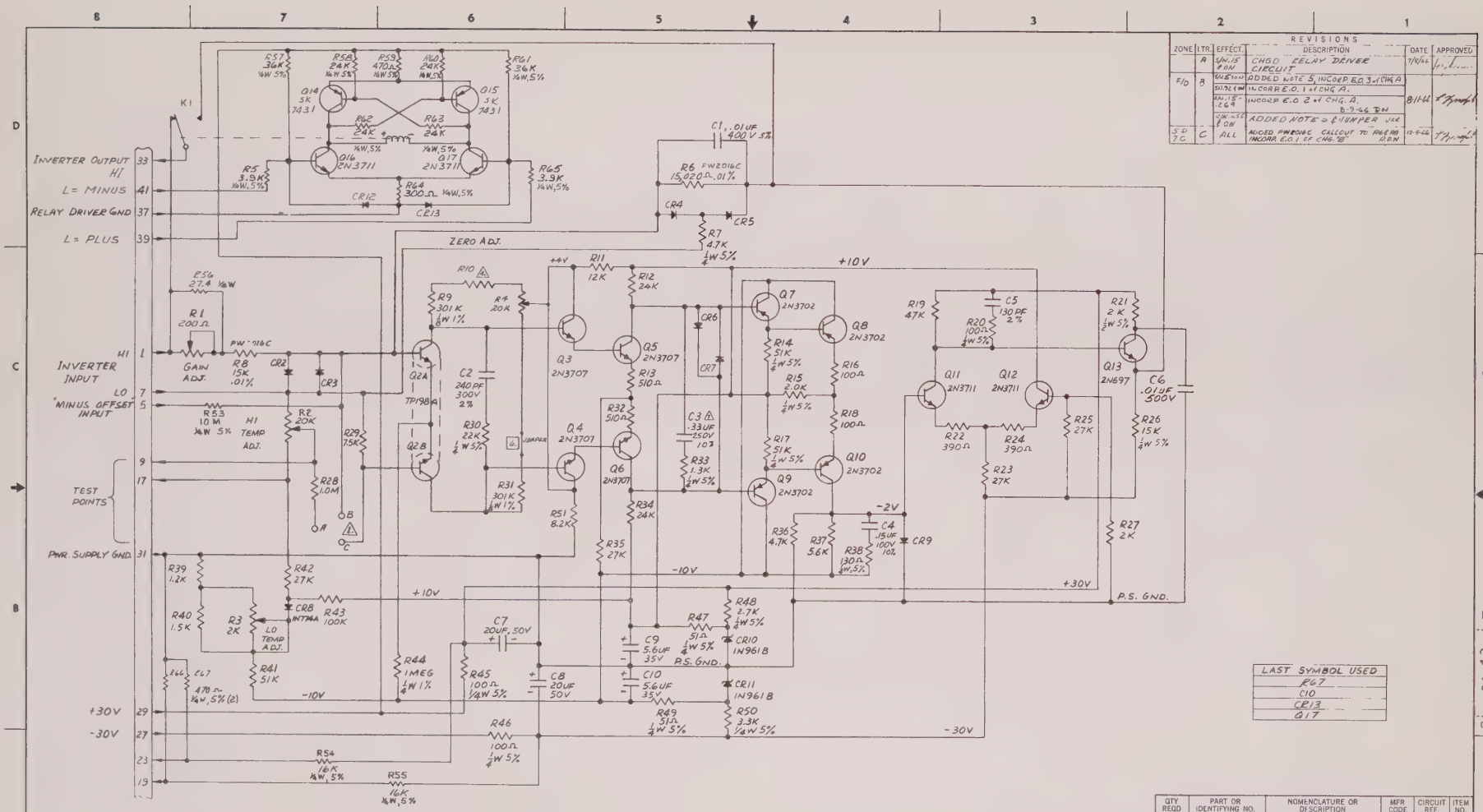
SCHEMATIC - COMPARATOR

SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-26

SCALE NONE WEIGHT SHEET 2 OF 2

36-26 M2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	A	5W,15 Ω 1W	CHGD RELAY DRIVER CIRCUIT	7/6/66	
F/0	B	604.5 Ω 1W	ADDED NOTE 5, INCORP E.O. 3 (CHG A)	8-11-66	
		511.5Ω 1W	" CORR E.O. 1 of CHG A.		
		2W,15Ω .264	INCORP E.O. 2 of CHG. A. 8-9-66 BM		
		20K ±5% 1W	ADDED NOTE 6 & JUMPER J46		
5D 7C	C	ALL	ADDED PW2016C CALLOUT TO PREPRO INCORP E.O. 1 OF CHG "B" ABM	12-9-66	

LAST SYMBOL USED
R67
C10
CR13
Q17

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

36-235	36-275	1	1	
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.	
APPLICATION		QTY		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO.
DRAWN M. BRINLEY 4-12-66
CHECK 5-2-66
APPR. 7/1
RELEASE DATE

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC, INVERTER

SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-43
SCALE	WEIGHT	SHEET 2 of 2

B: 36-43 SH. 2

⚠ 2108C334K .33 MF 200V ±10%, ALTERNATE FOR C3

⚠ ALTERNATE LOCATION OF R10. REF: 36-43 SHT 1 NOTE ⚠

3. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

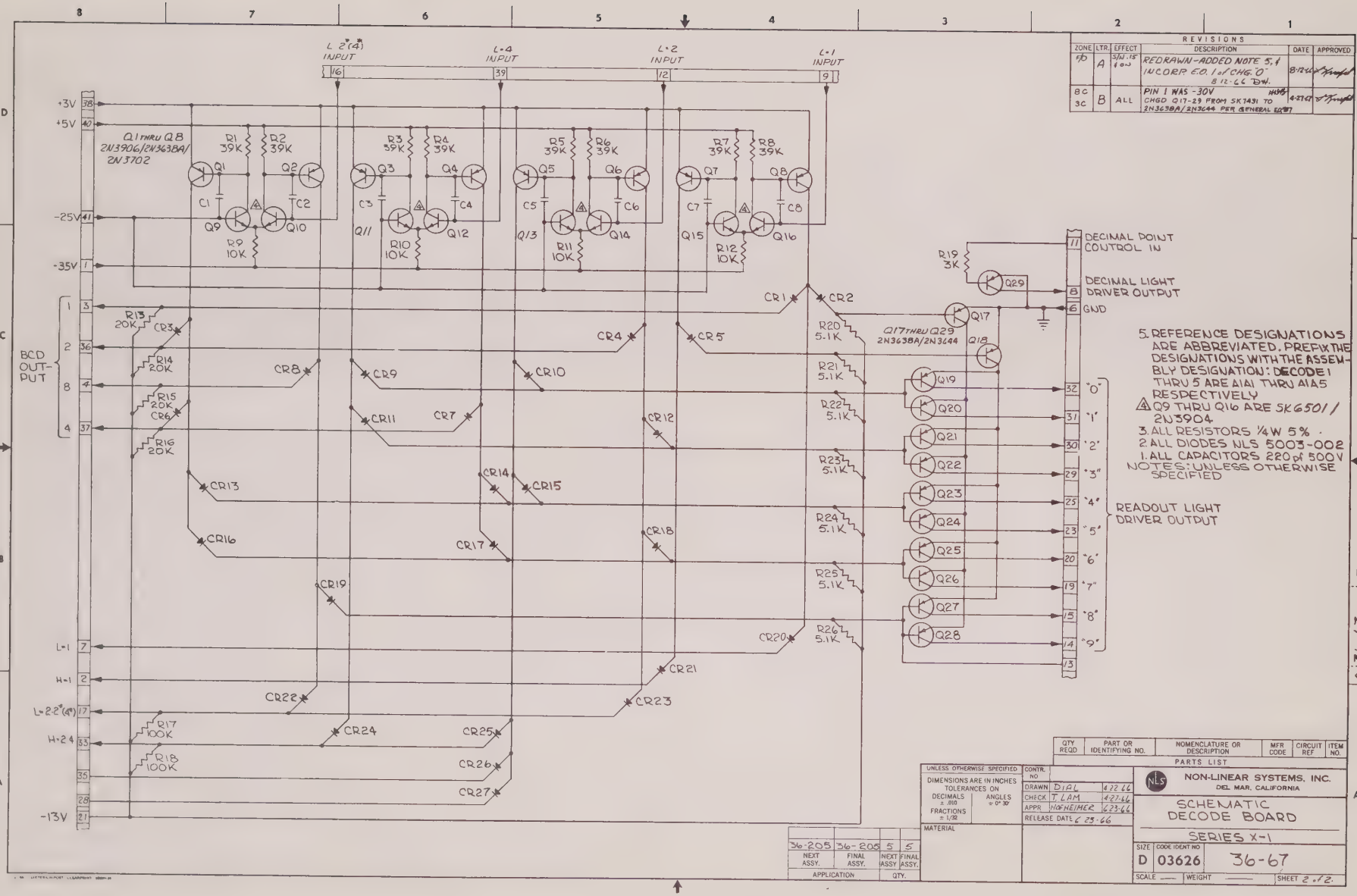
⚠ R10 IS A FACTORY SELECTED VALUE - REFER TO TEST DOC. NO. 725.

3. ALL DIODES ARE 5003-002.

2. ALL RESISTORS ARE ¼ WATT, 2%

⚠ JUMPER "A" TO "B" OR "A" TO "C" - REFER TO TEMPERATURE COMPENSATION TEST DOC. NO. 705.

NOTES: UNLESS OTHERWISE SPECIFIED



REVISIONS					
ZONE	LTR.	EFFECT	DESCRIPTION	DATE	APPROVED
6D	A	S/N 15 & UP	REDRAWN-ADDED NOTE 5, 4 INCORP. E.O. 1 of CHG. 0 8-12-66 DW.	8-12-66	
8C 3C	B	ALL	PIN 1 WAS -30V HOW CHGD Q17-29 FROM SK7431 TO 2N3638A/2N3644 PER GENERAL EO #7	4-27-67	

5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION: DECODE 1 THRU 5 ARE A1A1 THRU A1A5 RESPECTIVELY
4. Q9 THRU Q16 ARE SKG501 / 2N3904
3. ALL RESISTORS ¼W 5% .
2. ALL DIODES NLS 5003-002
1. ALL CAPACITORS 220 pf 500 V

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

36-205 NEXT ASSY.	36-205 FINAL ASSY.	5 NEXT ASSY	5 FINAL ASSY.	
APPLICATION		QTY.		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO
DRAWN DIAL 4-22-66
CHECK T. LAM 4-27-66
APPR. HOFHEIMER 6-23-66
RELEASE DATE 6-23-66

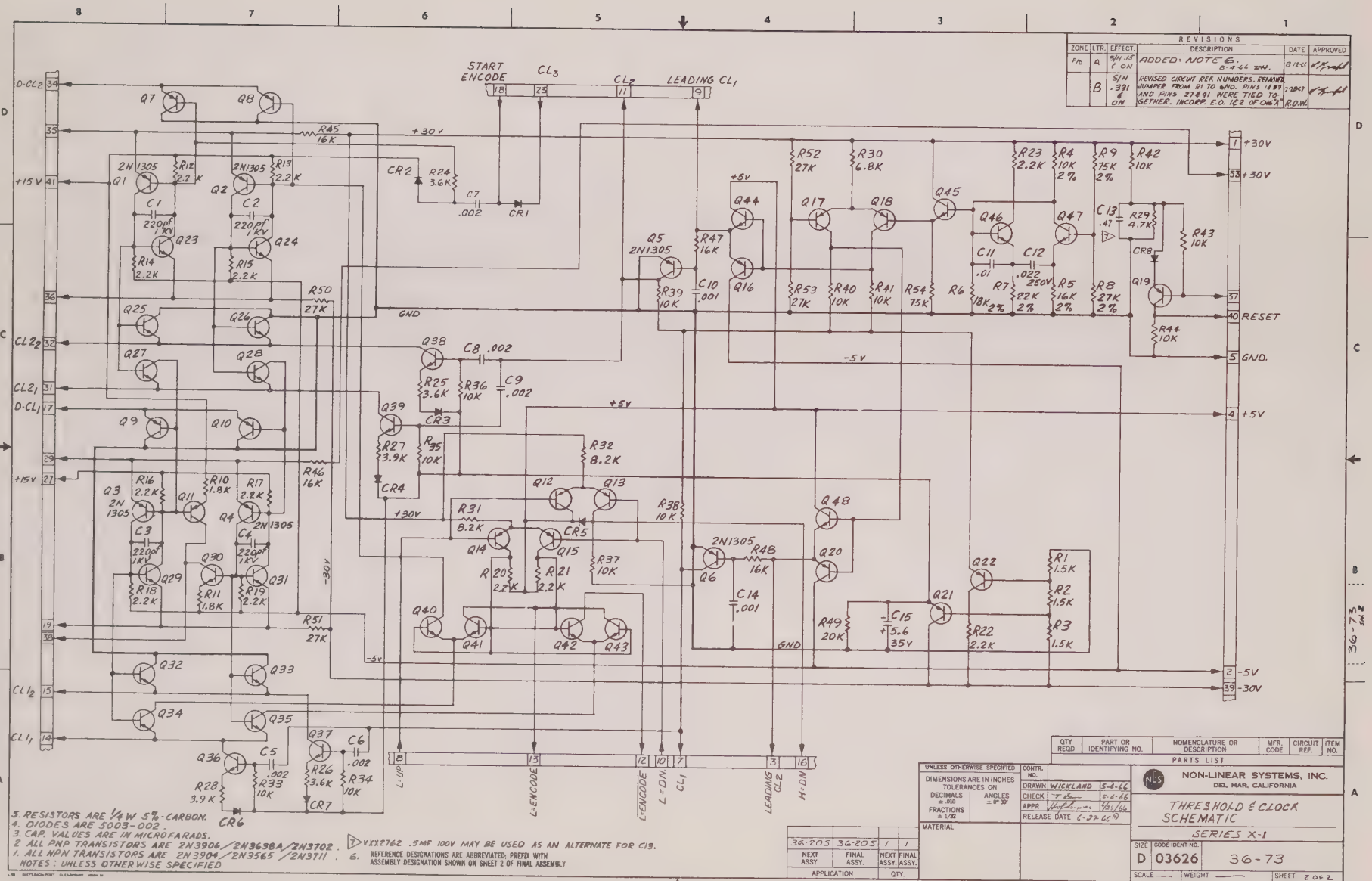
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC
DECODE BOARD
SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-67

SCALE — WEIGHT — SHEET 2 of 2

A 36-67 SH 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
1/b	A	S/N 15 & ON	ADDED: NOTE 6, D-4-66 2ND.	8-12-66	
	B	S/N .331 & ON	REVISED CIRCUIT PER NUMBERS. REMOVED JUMPER FROM R1 TO GND. PINS 1&39 AND PINS 27&41 WERE TIED TOGETHER. INCORP. E.O. 162 OF CHG'A	2-28-67	R.D.W.

1. RESISTORS ARE 1/4 W 5% - CARBON.
4. DIODES ARE 5003-002.
3. CAP. VALUES ARE IN MICROFARADS.
2. ALL PNP TRANSISTORS ARE 2N3906/2N3638A/2N3702.
1. ALL NPN TRANSISTORS ARE 2N3904/2N3565/2N3711.
NOTES: UNLESS OTHERWISE SPECIFIED

▷ VXX2762 .5MF 100V MAY BE USED AS AN ALTERNATE FOR C13.

6. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
36-205	36-205	1	1
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED — DIMENSIONS ARE IN INCHES. TOLERANCES ON DECIMALS ± .010, ANGLES ± 0° 30', FRACTIONS ± 1/32

MATERIAL

CONTR. NO.

DRAWN	WICKLAND	5-4-66
CHECK	[illegible]	5-6-66
APPR	[illegible]	5/21/66
RELEASE DATE	6-22-66 (2)	

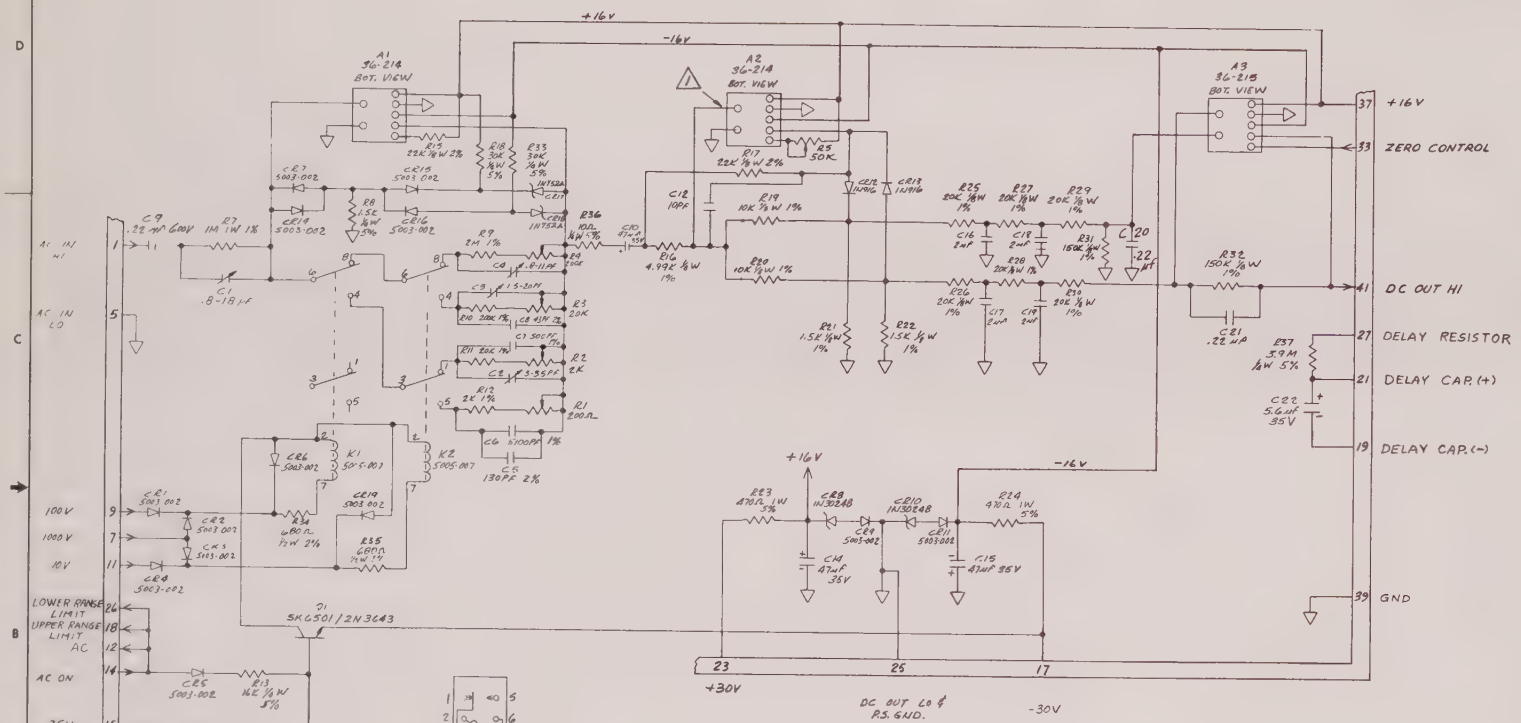
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

THRESHOLD & CLOCK SCHEMATIC

SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-73

SCALE — WEIGHT — SHEET 2 OF 2



CALIBRATION INSTRUCTIONS

PROC. NO.	RANGE	INPUT	ADJUST
1	1000V	0	FRONT PANEL CONTROL
2	1000 V	500V - 200 HZ	R1
3	1000 V	500V - 10K HZ	C1
4	100 V	100V - 200 HZ	R2
5	100 V	100V - 10K HZ	C2
6	10V	10V - 200 HZ	R3
7	10 V	10V - 10K HZ	C3
8	1V	1V - 200 HZ	R4
9	1V	1V - 10K HZ	C4

1. REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY
2. ⚠1 THIS POINT SHOULD MEASURE 0v ± 1MV. IF NOT, ADJUST R5.

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

36-218	36-210	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

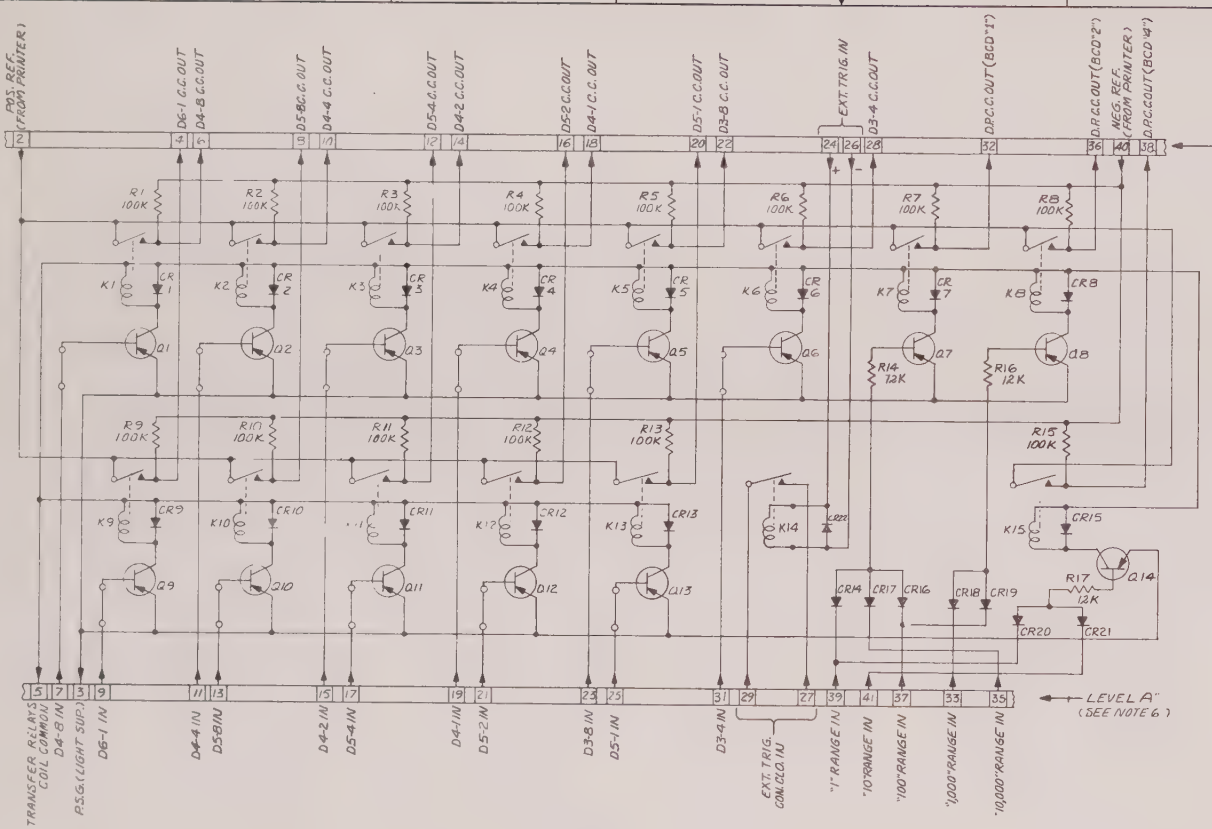
CONTR. NO.
DRAWN W. FINBERG 7-29-66
CHECK W. Kruegler 10-17-66
APPR R. Johnson 10-18-66
RELEASE DATE 10-19-66 (2)

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC
AC/DC CONVERTER
SERIES XI

SIZE	CODE IDENT NO.	
D	03626	36-97
SCALE	WEIGHT	SHEET 2 OF 2

36-97 SH 2



REVISIONS					
ZONE	LTR	EFFECT	DESCRIPTION	DATE	APPROVED
½-½	A	ALL	ADDED CR 22 TO P24 & P26 CIRCUIT	7-21-67	7-21-67

7. REFERENCE DESIGNATIONS ARE ABBREVIATED; PREFIX WITH ASSY. DES16. SHOWN ON SH. 2 OF FINAL ASSY.
6. LEVEL "A" MEANS PINS CONNECTED TO "INSIDE WORLD" CIRCUITRY BY P.C. - ODD NUMBERED PINS NEAREST REAR OF METER.
5. LEVEL "B" MEANS PINS CONNECTED TO "OUTSIDE WORLD" CIRCUITRY USING HARDWIRE OR COMPONENT SIDE OF BOARD, EVEN NUMBERED PINS NEAREST FRONT OF METER.
4. ALL TRANSISTORS ARE 2N3644 / SK7431.
3. ALL RELAYS ARE NLS TYPE S-12-27.
2. ALL DIODES ARE NLS TYPE 5003 002.
1. ALL RESISTORS ARE 1/4W, 5%.

NOTES: UNLESS OTHERWISE SPECIFIED.

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.
PARTS LIST					

36-218	36-218	/	/
NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

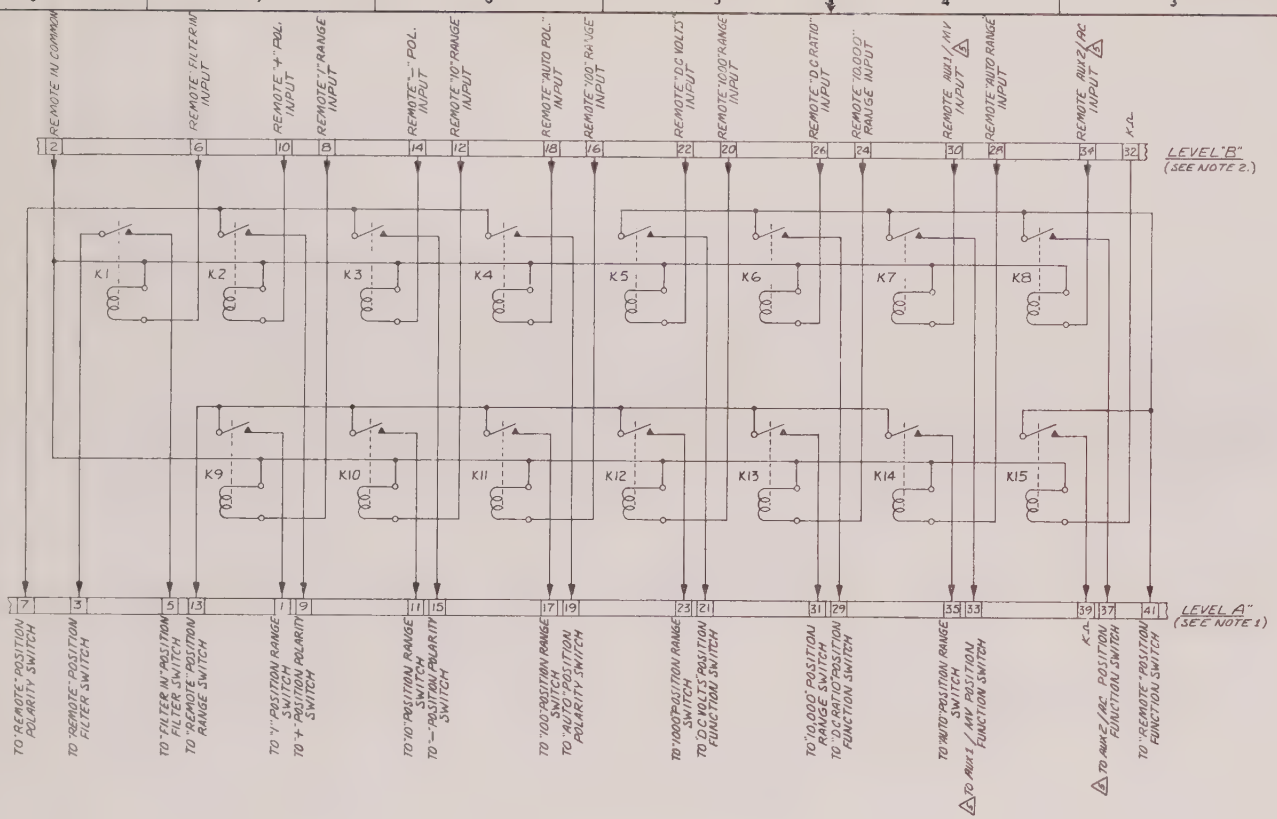
CONTR NO
DRAWN — 8-26-66
CHECK — B. 30 66
APPR — 9/7/66
RELEASE DATE 6-28-67

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC-
TRANSFER B'D NO 1
SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-179
SCALE	WEIGHT	SHEET 2 of 2

36-179 SH 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	A		ADDED, "2.5 AT PIN 32 & 33", "/AC AT PIN 30 & 33", "/MV AT PIN 30 & 33". ADDED NOTE #. 10	10-21-66	

△ "AUX 1" & "AUX 2" APPLY TO 36-218 ONLY.

4. REF. DESIG. ARE ABBREV.; PREFIX WITH ASSY. DESIG. SHOWN ON SH. 2 OF FINAL ASSY.
3. ALL RELAYS ARE NLS TYPE S-12-27.
2. LEVEL B MEANS: PINS CONNECTED TO "OUTSIDE WORLD" CIRCUITRY USING HARDWIRE ON COMPONENT SIDE OF BOARD, EVEN NUMBERED PINS NEAREST FRONT OF METER.
1. LEVEL "A" MEANS PINS CONNECTED TO "INSIDE WORLD" CIRCUITRY BY P.C.-ODD NUMBERED PINS NEAREST REAR OF METER.

NOTES: UNLESS OTHERWISE SPECIFIED.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

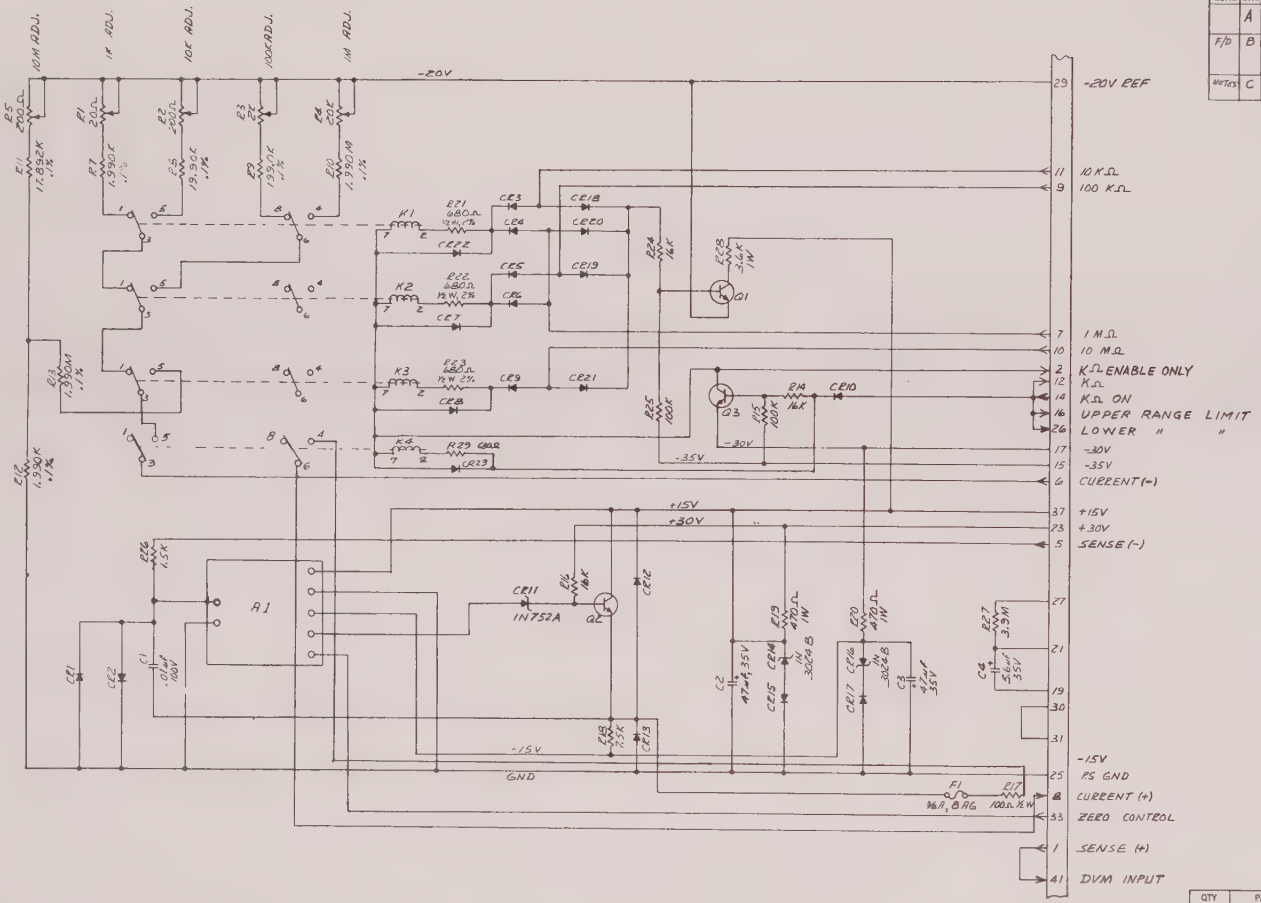
UNLESS OTHERWISE SPECIFIED CONTR. NO.
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ANGLES
DRAWN 8-24-66
CHECK 8-25-66
APPR 8-25-66
RELEASE DATE 8-25-66
MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC - (REMOTE INPUT) TRANSFER BOARD #3
SERIES X-1

SIZE D | CODE IDENT NO. 03626 | 36-185
SCALE —— | WEIGHT | SHEET 2 of 4

36-185 SH2 REV



BOTTOM VIEW
K1, K2, K3, K4

6. RELAYS K1,2 & 3 ARE POTTER/BRUM. HP11D-24V. K4 IS NLS 5005-007.
5. ALL TRANSISTORS ARE SK6501 / 2N3643
4. ALL RESISTORS ARE ¼W, 5%
3. ALL DIODES ARE NLS 5003-002
2. R7 THRU R13 ARE W.W.P. NLS PW2016 RESISTORS
1. REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

NOTES UNLESS OTHERWISE SPECIFIED

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	A	S/N 129 & ON	ADDED CONNECTION FROM Q3 TO PIN 2, TO ACCOMPLISH "LIFT GUARD". INCORP. E.O. 1, 2, 3 & 4 ON CHG 'D'.	4-24-67 MDS	[illegible]
F/D	B	S/N 129 & ON	INCORP E.O #1 OF CHG A (RELAYS WERE 5005-007) ADDED CR 23, R29, K4 REDESIGNED CIRCUIT	7-14-67 MM	7-17-67 R.T. [illegible]
NOTES	C	ALL	REV'S D, NOTE 6 "(ALL RELAYS WERE 31BL0001201 - BOURNS)	12-4-67 DMH	12-8-67 R.T. [illegible]

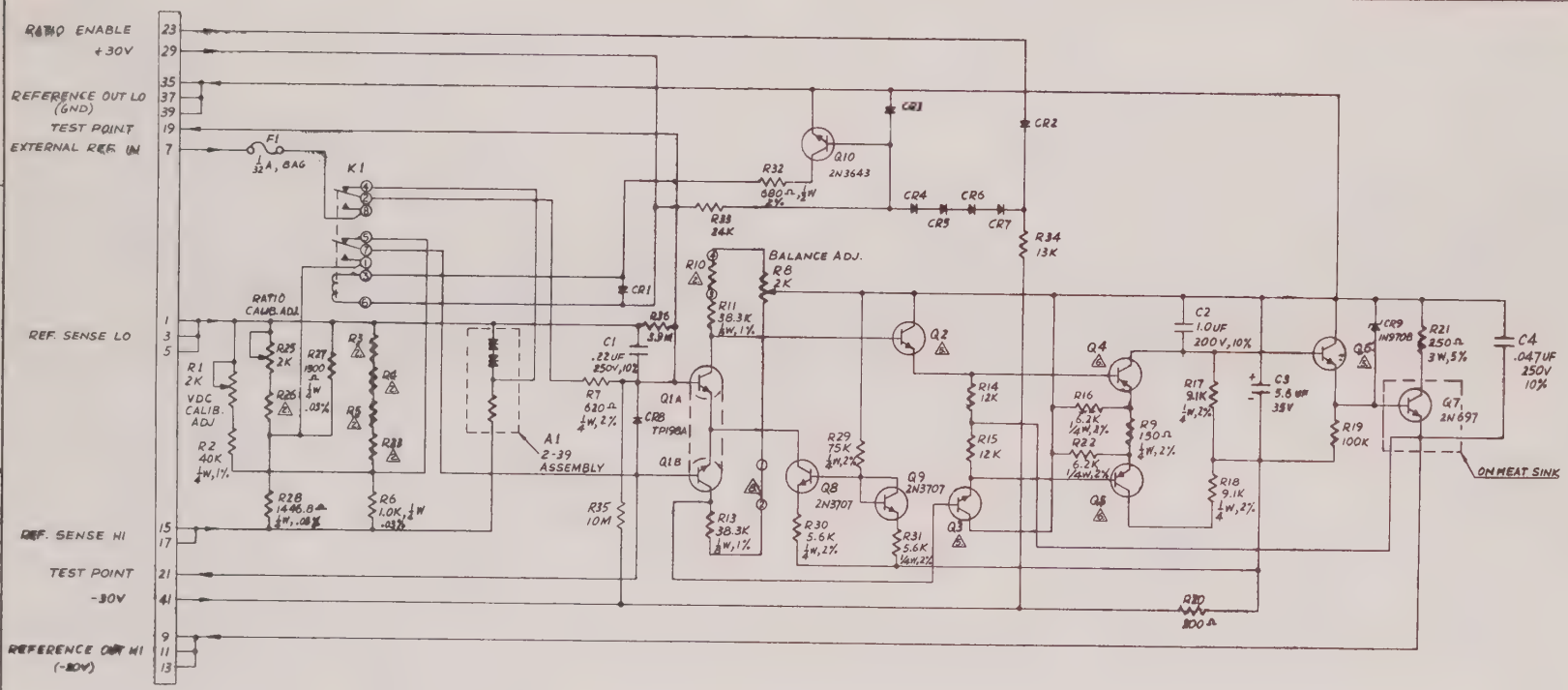
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO.	NON-LINEAR SYSTEMS, INC. DEL MAR, CALIFORNIA
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN Tom Deuchars 10-7-66 CHECK [illegible] 10-11-66 APPR. [illegible] 10-11-66 RELEASE DATE 10-13-66	SCHEMATIC K Ω / D.C. CONVERTER SERIES X-1 # SYSTEM S1
MATERIAL		SIZE D CODE IDENT NO. 03626 36-188 SCALE WEIGHT SHEET 2 OF 2

NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY.
APPLICATION		QTY.	

36-188 SH 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	A	VS I ON	I/CORP. E.O. 1, 2 & 3 OF ENG. O.	7-8-64	
	B	SN#.89 & ON	ADDED CR9 ACROSS Q6 TO PREVENT INSTRUMENT DAMAGE. ECO #2643	9-28-67	

NO. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 1 OF FINAL ASSEMBLY

9. REFER TO DOC. NO. T65 FOR ADJUSTING R25 & FOR SELECTION OF R26.

⚠ ALTERNATE LOCATION FOR R10. REF. 36-195 SHT. 1 NOTE 4.

7. DIODES ARE 5003-002

⚠ 2N3906, 2N3638A, MPS6518, 2N3702.

⚠ 2N3904, 2N3711, 2N3565

4. DOCUMENT T19 GIVES INSTRUCTION FOR ADJUSTING R1

3. DOCUMENT T15 GIVES INSTRUCTION FOR ADJUSTING R8.

⚠ RESISTORS R8, 4, 5, 10 & 23 ARE SELECTED, SEE DOC. T15.

1. RESISTORS ARE 1/4W, 5%

NOTES: UNLESS OTHERWISE SPECIFIED

QTY. REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO.	
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN	H. BRINLEY 8-1-66
	CHECK	J. Knapp 8-16-66
	APPR	R. Williams 8-16-66
	RELEASE DATE	8-17-66
MATERIAL		

36-383	36-383	1	1
36-222	36-222	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY.
APPLICATION		QTY.	

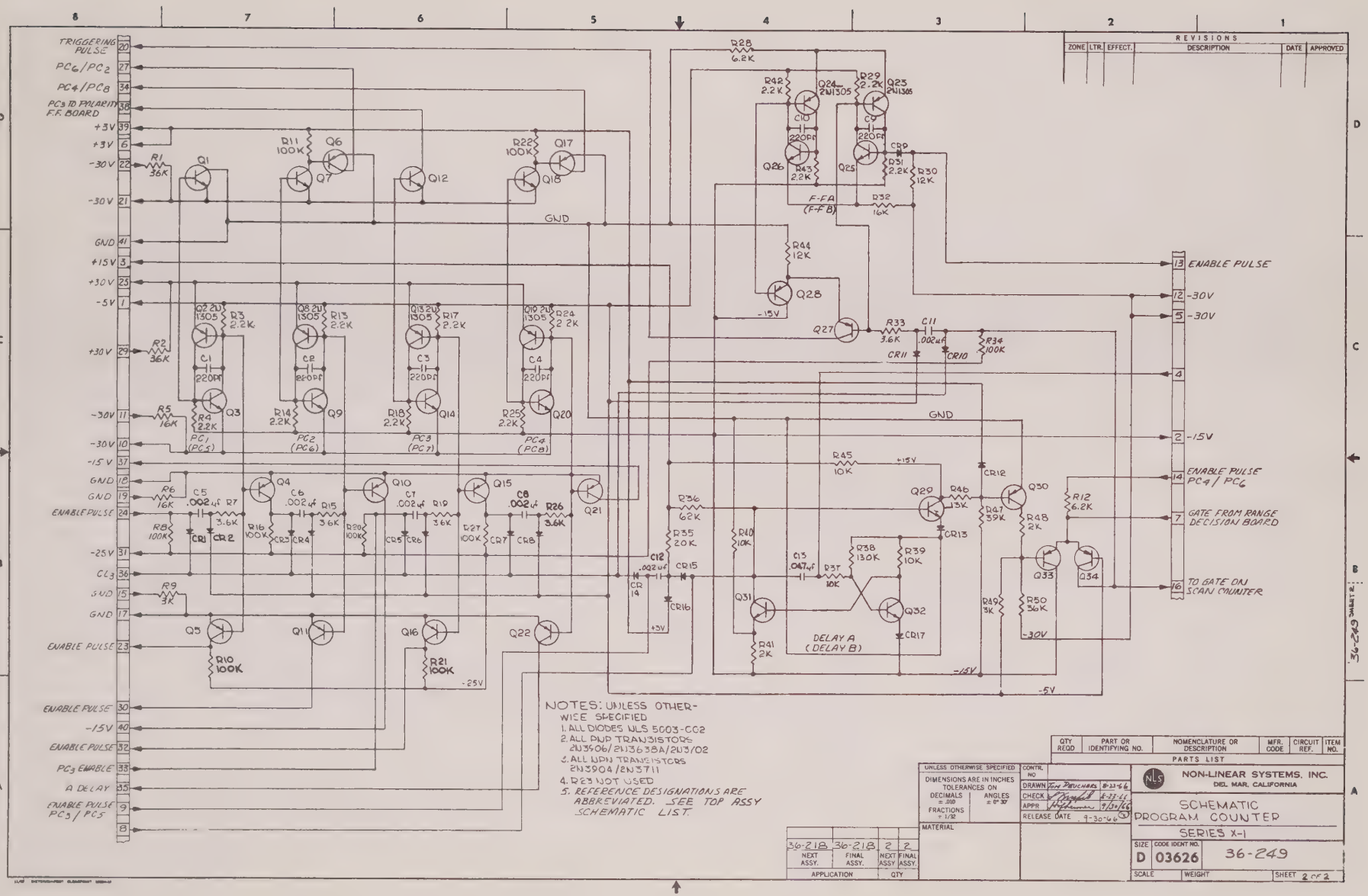
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC, RATIO REFERENCE SUPPLY

SERIES X1

SIZE	CODE IDENT NO.	
D	03626	36-195
SCALE	WEIGHT	SHEET 2 OF 2

36-195 SHT. 2



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL DIODES WLS 5003-002
2. ALL PNP TRANSISTORS 2N3906/2N3638A/2N3702
3. ALL NPN TRANSISTORS 2N3904/2N3711
4. R23 NOT USED
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. SEE TOP ASSY SCHEMATIC LIST.

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY.
36-218	36-218	2	2
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO
DRAWN Tom Peuchaud 8-22-66
CHECK 8-22-66
APPR 9/30/66
RELEASE DATE 9-30-66

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

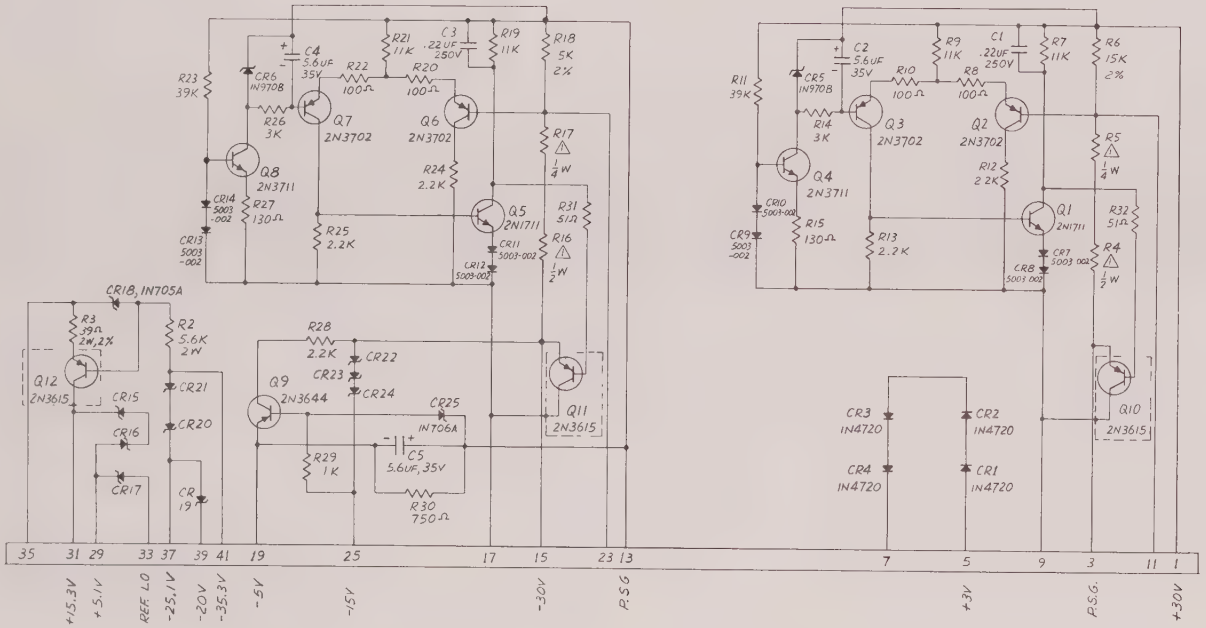
SCHEMATIC
PROGRAM COUNTER
SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-249

SCALE | WEIGHT | SHEET 2 OF 2

36-249 SHEET 2

REVISIONS					
ZONE	LTR	EFFECT	DESCRIPTION	DATE	APPROVED
8C 7C	A	ALL	R3 WAS 47Ω (CD18 WAS ½ MS.1425, CR25 WAS ½ MS.6425) INT. E.O. 1 OF 0.	4-22-67	



4. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS A TH THE ASSEMBLY DESIGNATION SHOWN ON SH 2 OF THE FINAL ASSEMBLY
3. DIODES CR15 THRU CR24 ARE IN3826A (EXCEPT CR18)
2. ALL RESISTORS ARE ¼ W, 5%
⚠ FACTORY SELECTED VALUES, REF. 36-266 SHT. 1.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO		
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN	H. BRINLEY	8-18-66
	CHECK	J. Lam	9-27-66
	APPR	R. Hellman	9/27/66
	RELEASE DATE		
MATERIAL			

36-218 NEXT ASSY.	36-218 FINAL ASSY.	1 NEXT ASSY.	1 FINAL ASSY
APPLICATION		QTY	

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

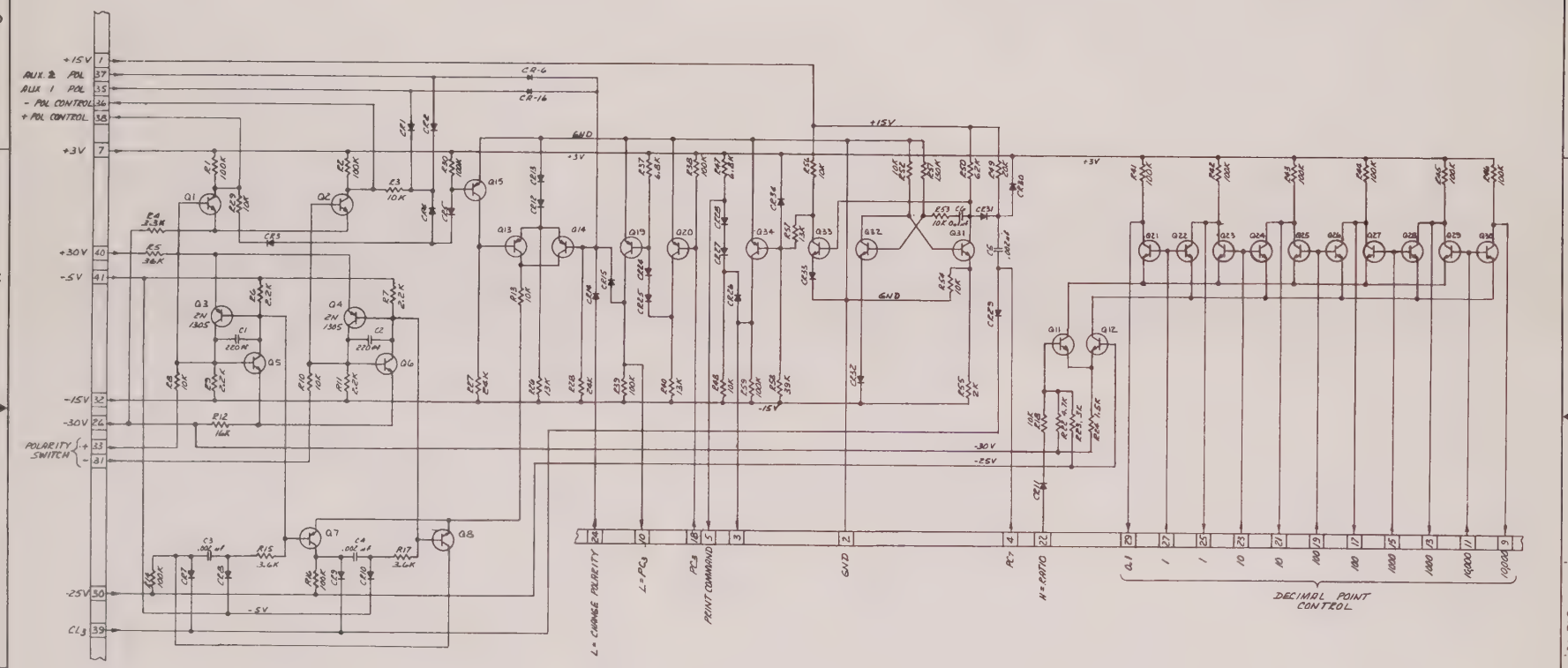
SCHEMATIC, REGULATOR

SERIES X1

SIZE	CODE IDENT NO.	
D	03626	36-266

SCALE	WEIGHT	SHEET 2 OF 2

36-266 SH 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY
3. ALL DIODES NLS 5003-002
2. ALL NPN TRANSISTORS ARE 2N3904 / 2N3711
1. ALL PNP TRANSISTORS ARE 2N3906 / 2N3638A / 2N3702.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO

PARTS LIST

36-218	36-218	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY.
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

MATERIAL

CONTR. NO
DRAWN Tom Dauchan 6/16/66
CHECK T. Lan 7/1/66
APPR [illegible] 7/8/66
RELEASE DATE

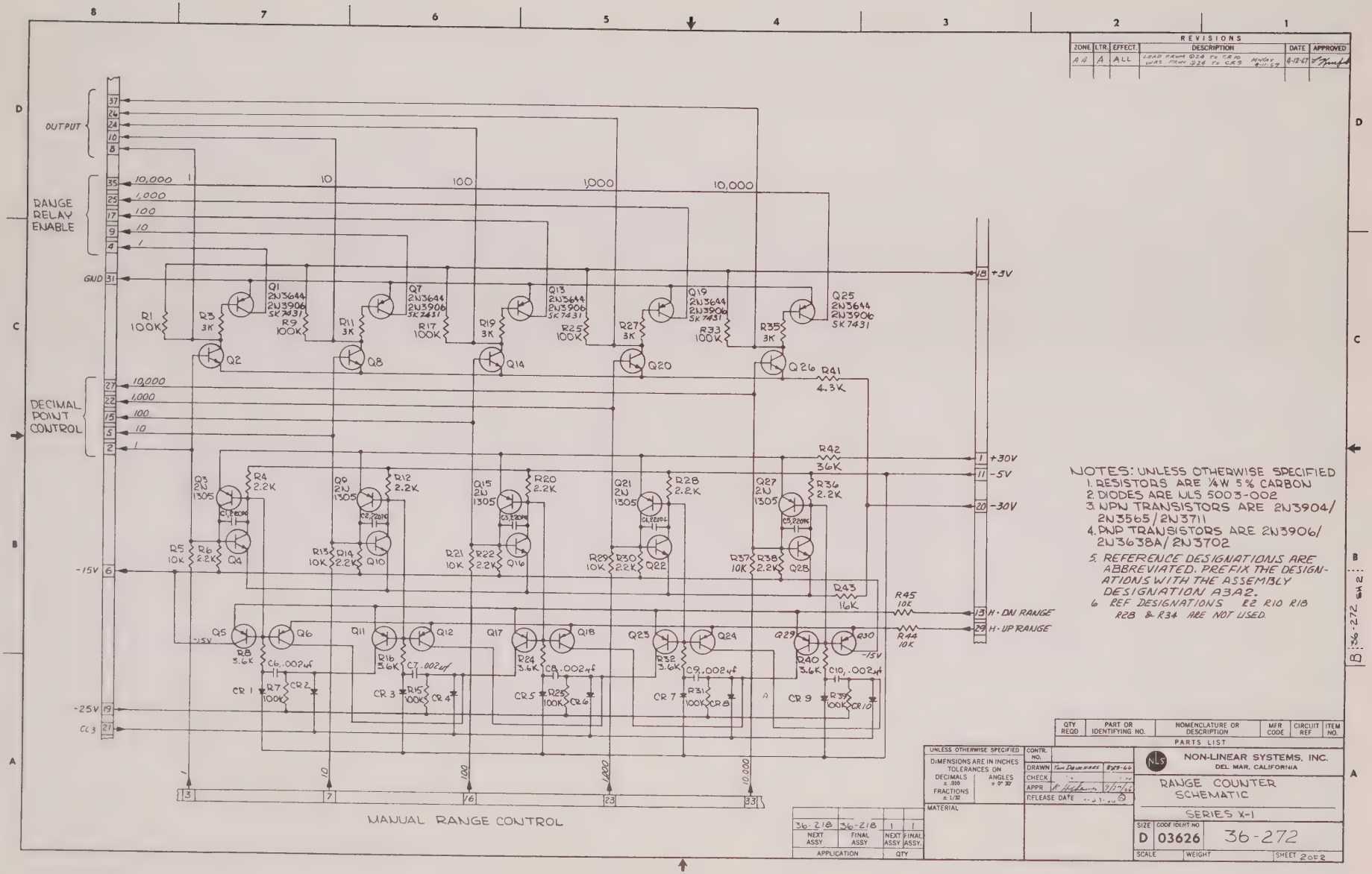
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

POLARITY FLIP-FLOP & LOGIC
SCHEMATIC
SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-269

SCALE | WEIGHT | SHEET 2 OF 2

36-269 SH 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
A4	A	ALL	LOAD FROM Q24 TO CR10 WAS FROM Q24 TO CR9 MWAY 4-11-67	4-12-67	

NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTORS ARE ¼W 5% CARBON
2. DIODES ARE ULS 5003-002
3. NPN TRANSISTORS ARE 2N3904/ 2N3565/2N3711
4. PNP TRANSISTORS ARE 2N3906/ 2N3638A/2N3702
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A3A2.
6. REF DESIGNATIONS R2 R10 R18 R28 & R34 ARE NOT USED.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

36-218 NEXT ASSY	36-218 FINAL ASSY	1 NEXT ASSY	1 FINAL ASSY.
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

CONTR. NO.
DRAWN Tom Delehanty 8-29-66
CHECK
APPR. K. Hoffman 9/10/66
RELEASE DATE

MATERIAL

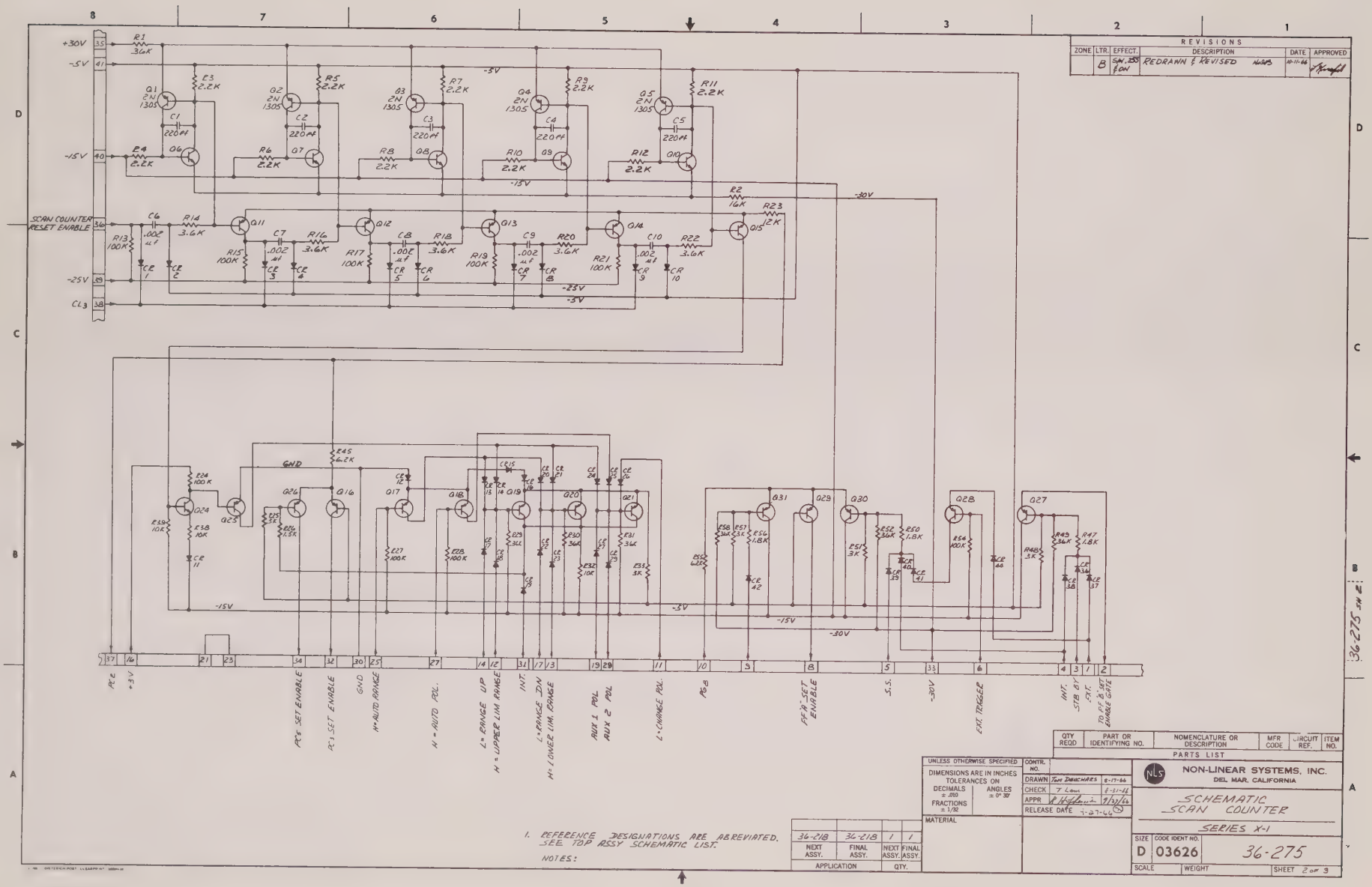
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

RANGE COUNTER SCHEMATIC

SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-272
SCALE	WEIGHT	SHEET 2 OF 2

B 36-272 SH 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	B	SN. 255 FON	REDRAWN & REVISED NLS	10-11-66	

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

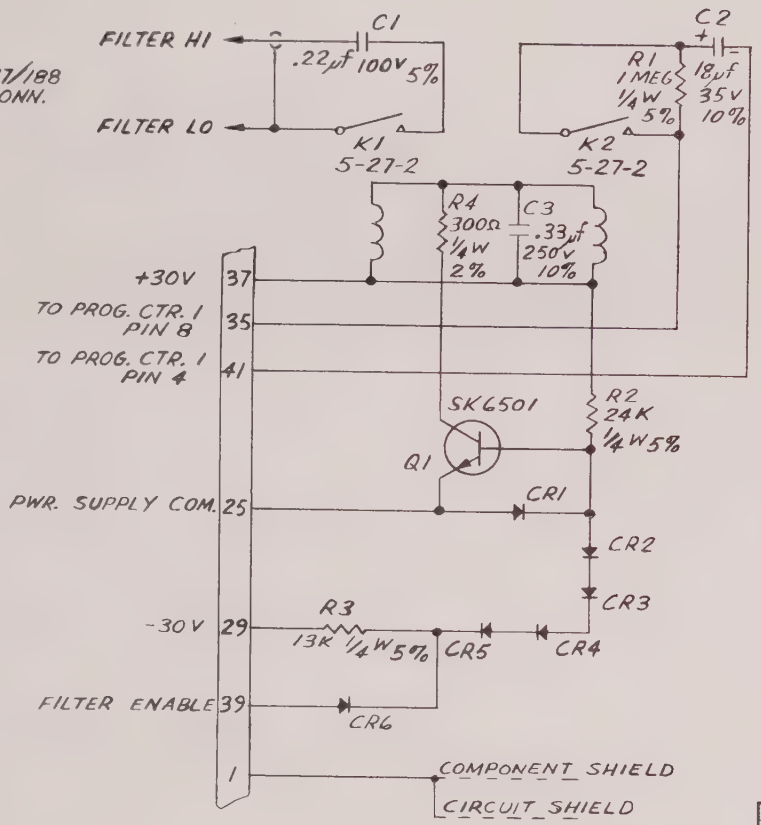
UNLESS OTHERWISE SPECIFIED	CONTR. NO.	NON-LINEAR SYSTEMS, INC. DEL MAR, CALIFORNIA
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN Tom Deuschares 8-17-66	
	CHECK T. Lewis 8-31-66	SCHEMATIC SCAN COUNTER
	APPR R. Hitchcock 9/12/66	SERIES X-1
MATERIAL	RELEASE DATE 1-27-66	SIZE D · CODE IDENT NO. 03626 · 36-275
		SCALE · WEIGHT · SHEET 2 of 3

36-218	36-218	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
APPLICATION		QTY.	

NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. SEE TOP ASSY SCHEMATIC LIST.

36-275 SH 2



36-296 SH2

REVISIONS					
ZONE	LTR	EFFECT	DESCRIPTION	DATE	APPROVED

2. DIODES ARE NLS 5003-002.
1. REFERENCE DESIGNATIONS ARE ABBREVIATED SEE TOP ASS'Y. SCHEMATIC LIST.
NOTES: UNLESS OTHERWISE SPECIFIED.

NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
36-218	36-218	1	1
APPLICATION		QTY	

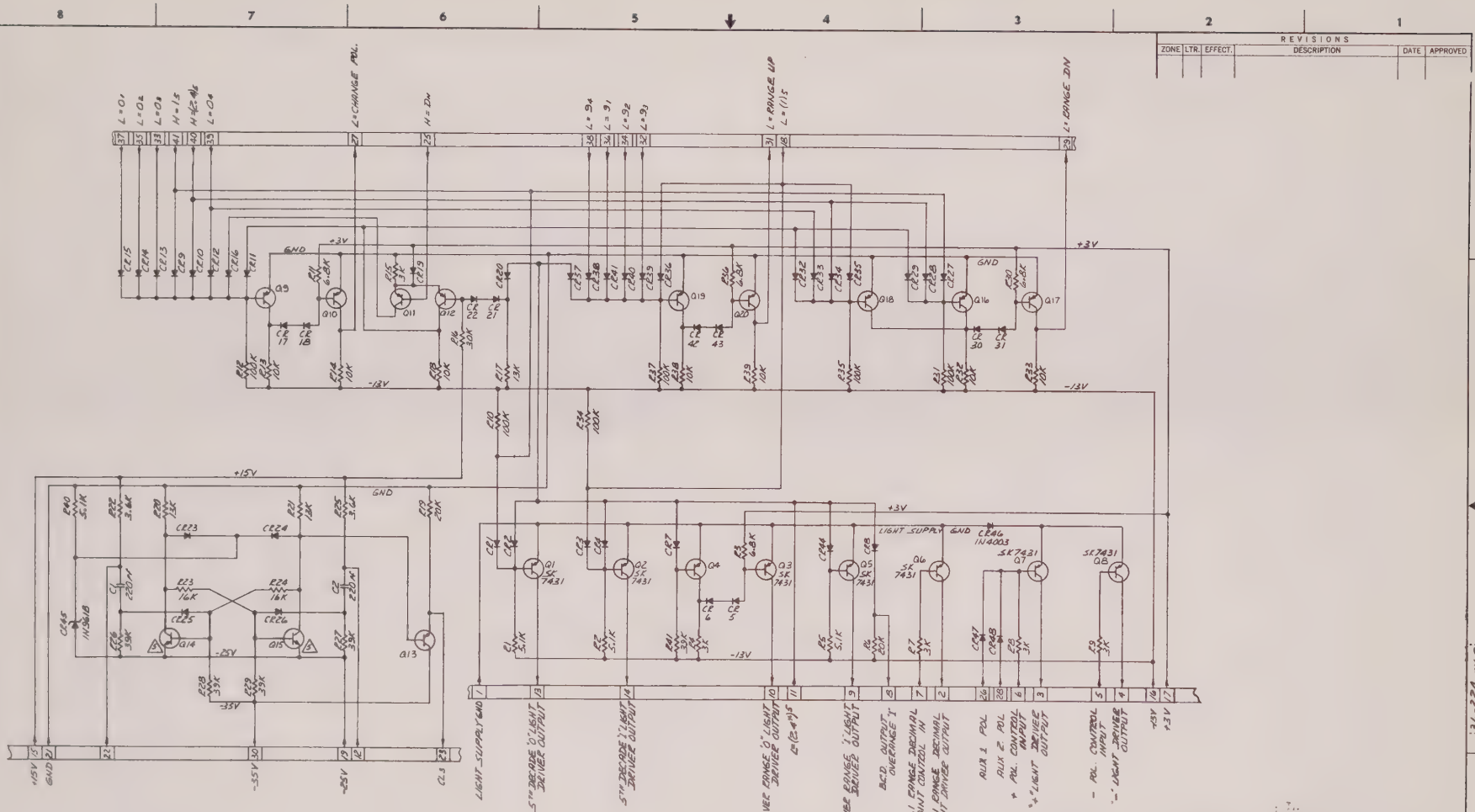
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR NO.
DRAWN WICKLAND 8-26-66
CHECK
APPR
RELEASE DATE

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

FILTER ASSEMBLY SCHEMATIC

SIZE	CODE IDENT NO.	
B	03626	36-296
SCALE	WEIGHT	SHEET 2 OF 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

△5 ALL NPN TRANSISTORS ARE SK 6501/2N3904.
4. ALL PNP TRANSISTORS ARE 2N3906/2N3638A/2N3702
3. ALL DIODES NLS 5003-002.
2. ALL RESISTORS ¼W 5%
1. REF. DESIG. ARE ABBREV.; PREFIX WITH ASSY. DESIG. SHOWN ON SH. 2 OF FINAL ASSY

NOTES; UNLESS OTHERWISE SPECIFIED

36-218	36-218	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

MATERIAL

CONTR. NO

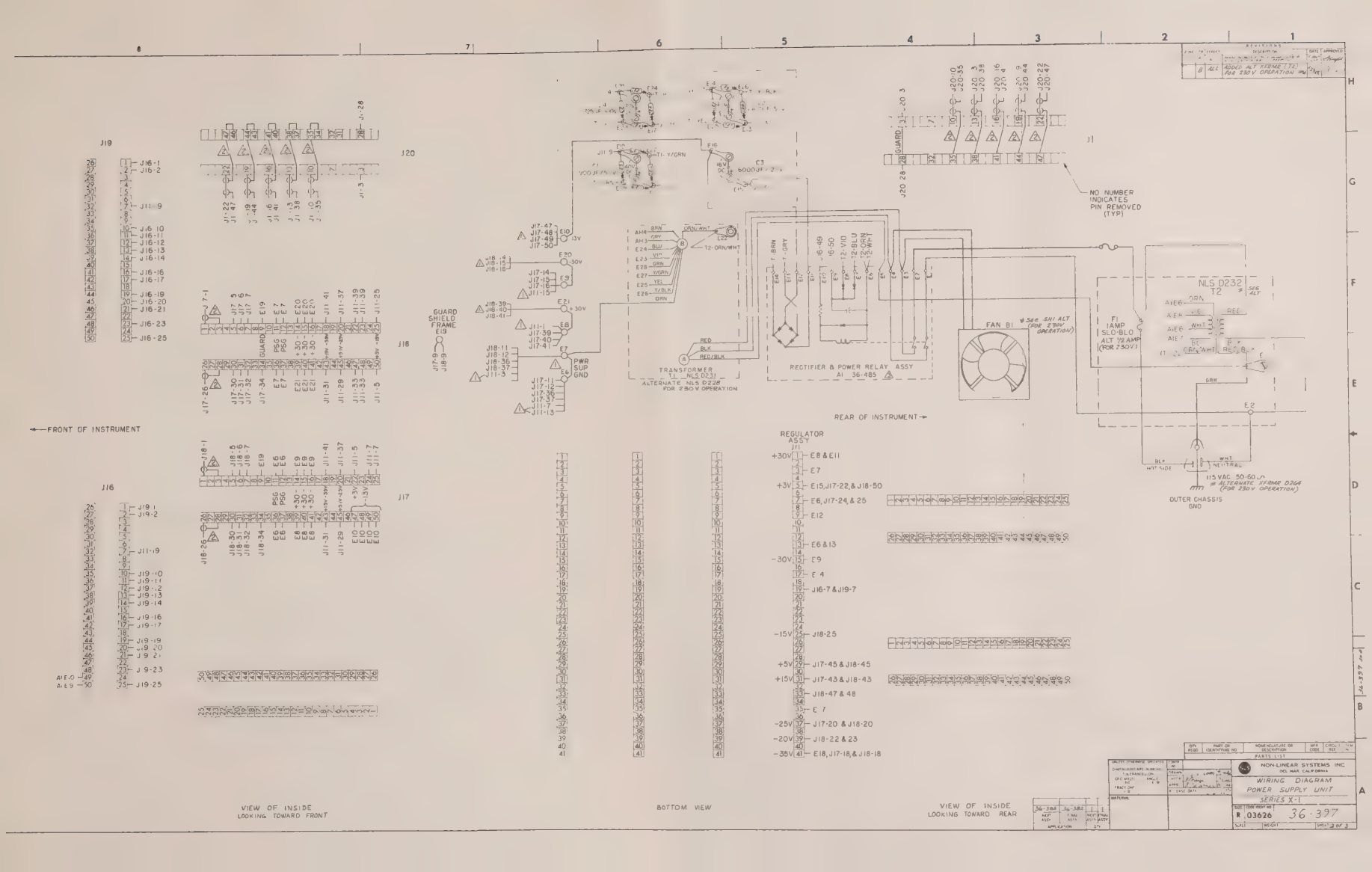
DRAWN	Ron Deuchars	5-22-66
CHECK	Tom Yu	5-26-66
APPR	Hyllemar	7/20/66
RELEASE DATE	7-20-66	

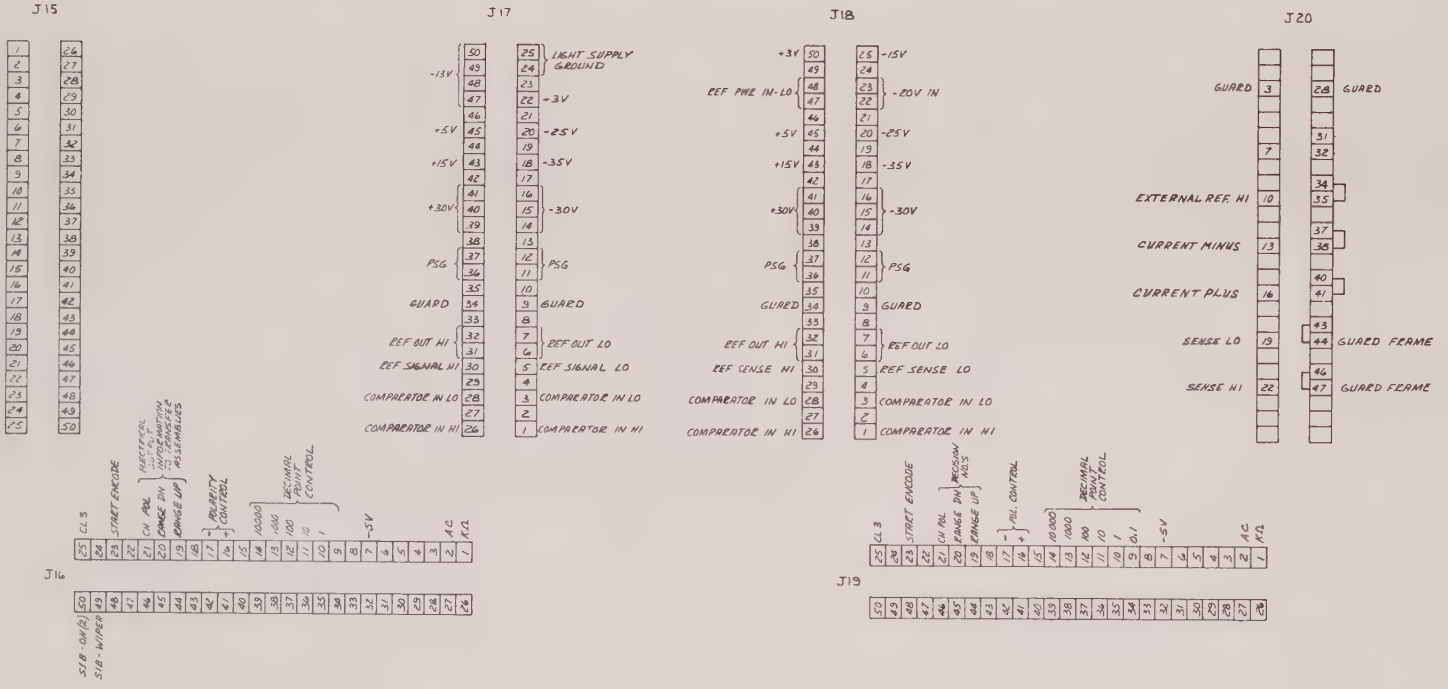
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC - RANGE DECISION LOGIC
SERIES X-1

SIZE	CODE IDENT NO	36-324
D	03626	
SCALE	WEIGHT	SHEET 2 OF 2

36-324 REV E


J19
J16
J20
J18
J17
J1
J11
J10
J9
J8
J7
J6
J5
J4
J3
J2
J1
J16-1
J16-2
J16-10
J16-11
J16-12
J16-13
J16-14
J16-16
J16-17
J16-19
J16-20
J16-21
J16-23
J16-25
J19-1
J19-2
J19-10
J19-11
J19-12
J19-13
J19-14
J19-16
J19-17
J19-19
J19-20
J19-23
J19-25
J11-9
J11-19
J20-10
J20-35
J20-3
J20-38
J20-16
J20-4
J20-9
J20-44
J20-22
J20-47
J20 28-3
GUARD
NO NUMBER INDICATES PIN REMOVED (TYP)
FRONT OF INSTRUMENT
REAR OF INSTRUMENT
GUARD SHIELD FRAME E19
PWR SUP GND
TRANSFORMER T1 NLS D231 ALTERNATE NLS D228 FOR 230V OPERATION
RECTIFIER & POWER RELAY ASSY A1 36-485
FAN B1
See SH1 ALT (FOR 230V OPERATION)
F1 1AMP SLO-BLO ALT ½ AMP (FOR 230V)
NLS D232 T2
SEE ALT
115 VAC 50-60 ~
ALTERNATE XFORMR D26A (FOR 230 V OPERATION)
OUTER CHASSIS GND
REGULATOR ASSY J11
+30V E8 & E11
E7
+3V E15, J17-22, & J18-50
E6, J17-24, & 25
E12
E6 & 13
-30V E9
E 4
J16-7 & J19-7
-15V J18-25
+5V J17-45 & J18-45
+15V J17-43 & J18-43
J18-47 & 48
E 7
-25V J17-20 & J18-20
-20V J18-22 & 23
-35V E18, J17-18, & J18-18
VIEW OF INSIDE LOOKING TOWARD FRONT
BOTTOM VIEW
VIEW OF INSIDE LOOKING TOWARD REAR
NON-LINEAR SYSTEMS INC
DEL MAR, CALIFORNIA
WIRING DIAGRAM
POWER SUPPLY UNIT
SERIES X-1
R 03626
36-397
SHEET 2 OF 3



VIEW OF CONNECTORS FROM OUTSIDE

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

APPLICATION		QTY.	
NEXT ASSY	FINAL ASSY.	NEXT ASSY	FINAL ASSY
36-382	36-382	1	1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANG. ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

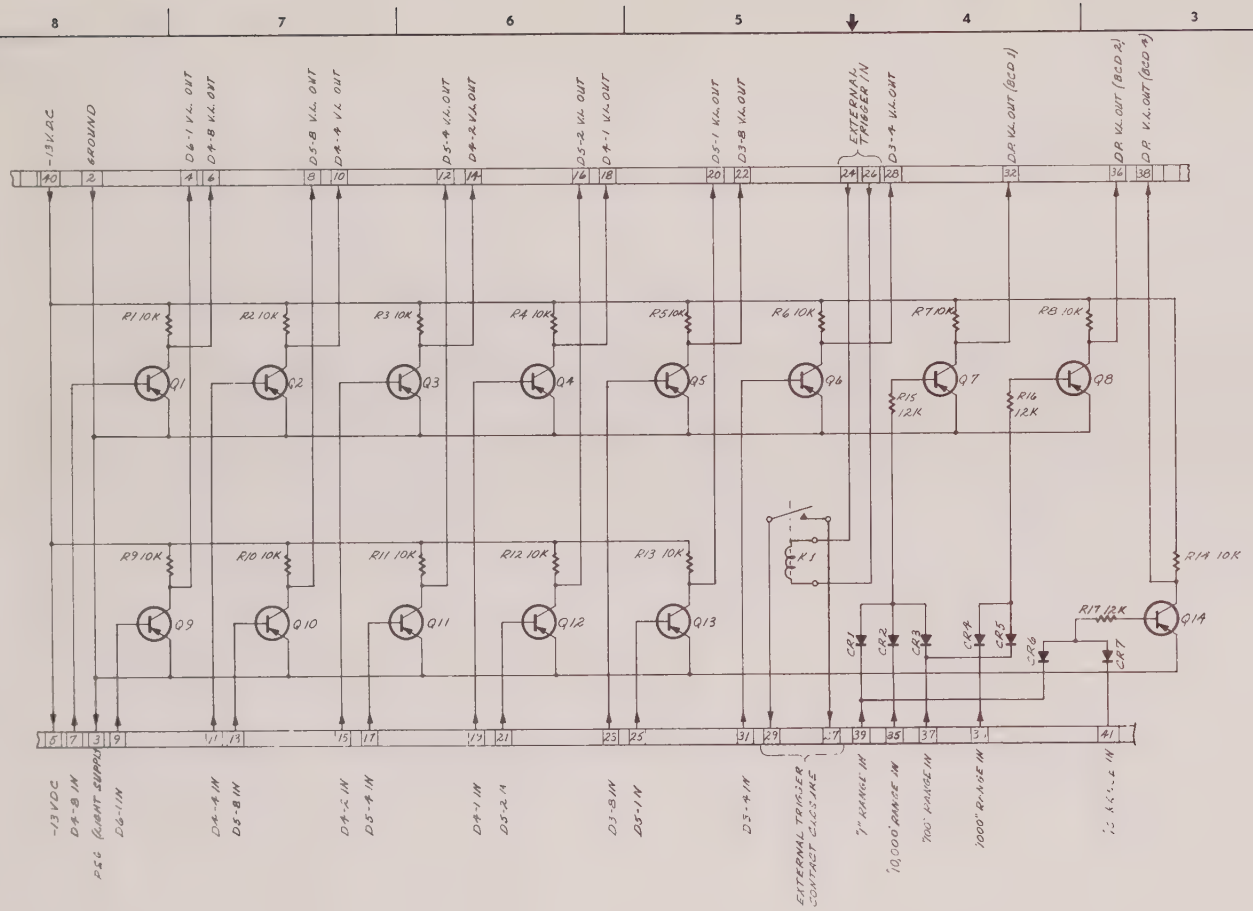
CONTR. NO
DRAWN J.A. COMBS 12-21-66
CHECK [illegible] 12-22-66
APPR R. Warner 12-23-66
RELEASE DATE

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

CONNECTOR PIN DESIGNATIONS
INTERNAL
SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-397
SCALE	WEIGHT	SHEET 3 OF 3

36-397 SH 3



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	A	S/N 217 & ON	36-432 SUB ASS'Y REPLACES 36-178 5-12-2 RELAY REPLACES 5-12-27 (R1)	11-21-67	R.T.W.

QTY. REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.
		PARTS LIST			

36-383	36-393	1	
36-381	36-391	1	
NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .100
FRACTIONS ± 1/32
ANGLES ± 30'

CONTR NO
DRAWN
CHECKED
APPR
RELEASE DATE
MATERIAL

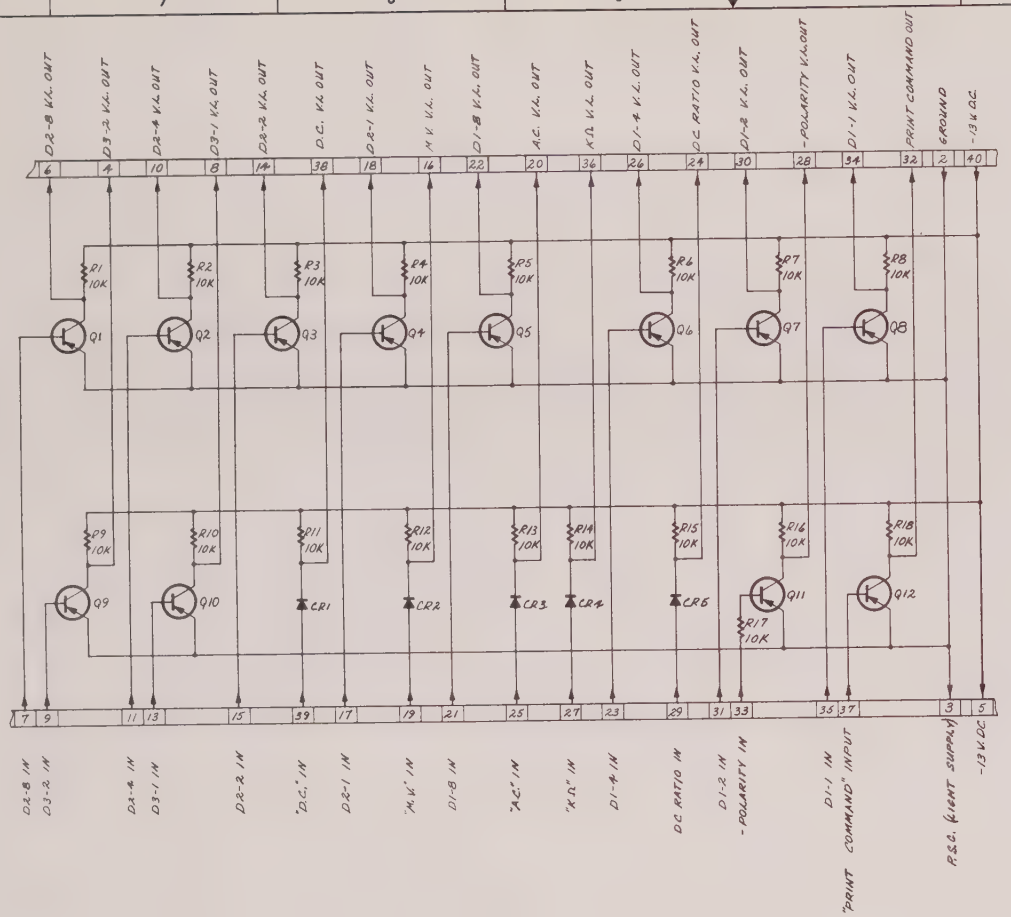
NONLINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

DIGITAL VOLTMETER
TRANSFER BOARD
SCHEMATIC

SIZE D | CODE IDENT NO. 03626 | 36-409 REV. A

SCALE | SHEET 2 OF 2

NOTES UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE ¼W ±5% 1/8CA
2. ALL DIODES ARE NLS 5003-002
3. ALL RELAYS ARE NLS 5-12-2
4. ALL TRANSISTORS ARE 2N706-A/SET A31



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
	A	6/N 296 EON	36-611 SUB ASS'Y. REPLACES 36-466	1-17-67	R.T.G.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.
		PARTS LIST			

36-387	36-387	1	1
36-384	36-384	1	1
36-383	36-383	1	1
36-381	36-381	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO.

DRAWN	COMBS	1/19/67
CHECK	[illegible]	1-31-67
APPR	R. W. Green	1-31-67

RELEASE DATE 2-1-67 TR.

NON-LINEAR SYSTEMS, INC.
DEL MAR CALIFORNIA

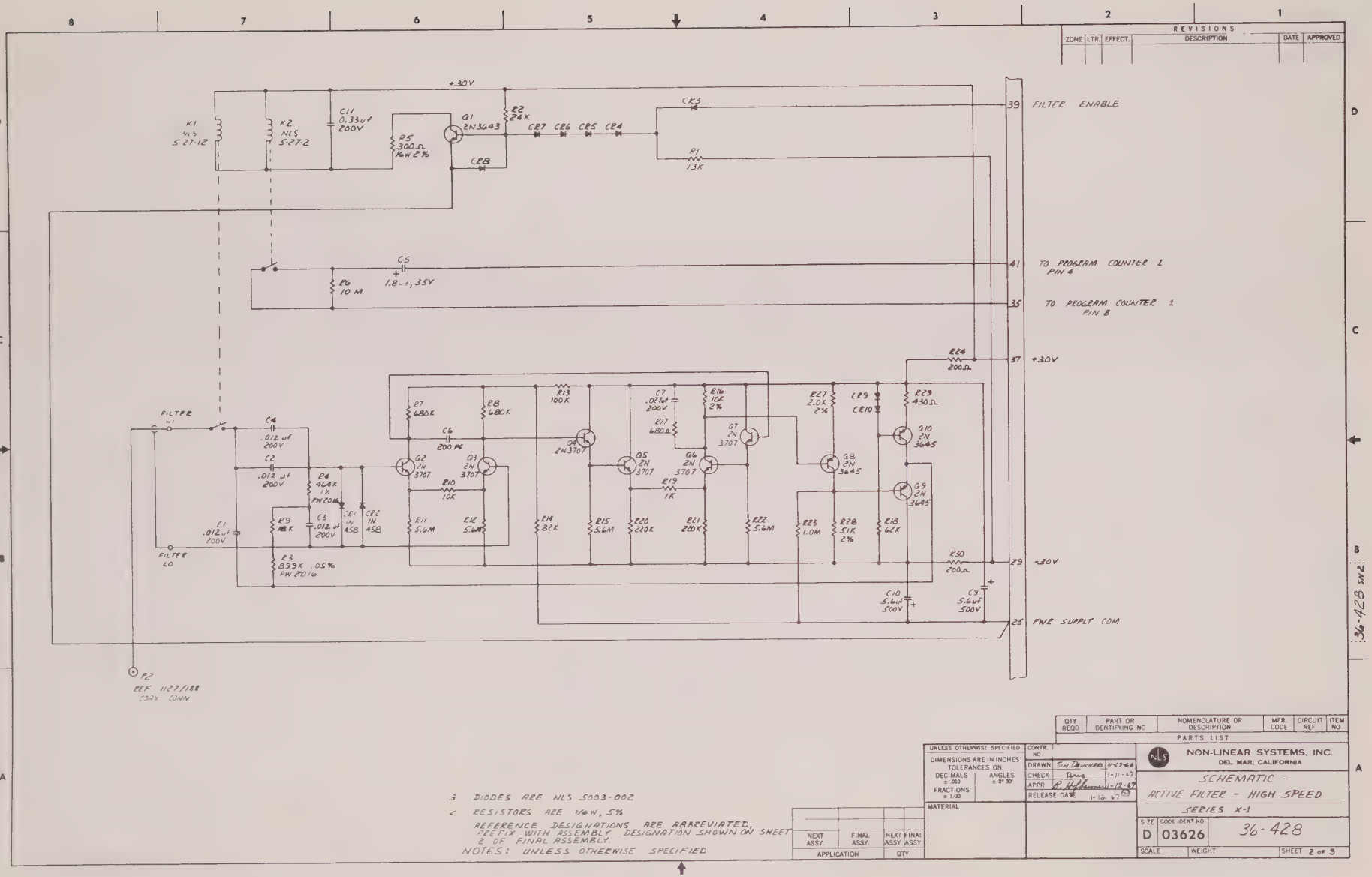
SCHEMATIC
TRANSFER BOARD NO. 2
SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-413
SCALE	WEIGHT	SHEET 2 OF 2

36-413 SCH A2

1. ALL DIODES ARE NLS 5003-002
3. ALL TRANSISTORS ARE 2N3644/SK7431
2. ALL RESISTORS ARE 1/4 W. 5% TOL.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED; PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

NOTES: UNLESS OTHERWISE SPECIFIED



QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO

PARTS LIST

REVISIONS					
ZONE	LTR	EFFECT.	DESCRIPTION	DATE	APPROVED

3 DIODES ARE NLS 5003-002

< RESISTORS ARE 1/6W, 5%

REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY.

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

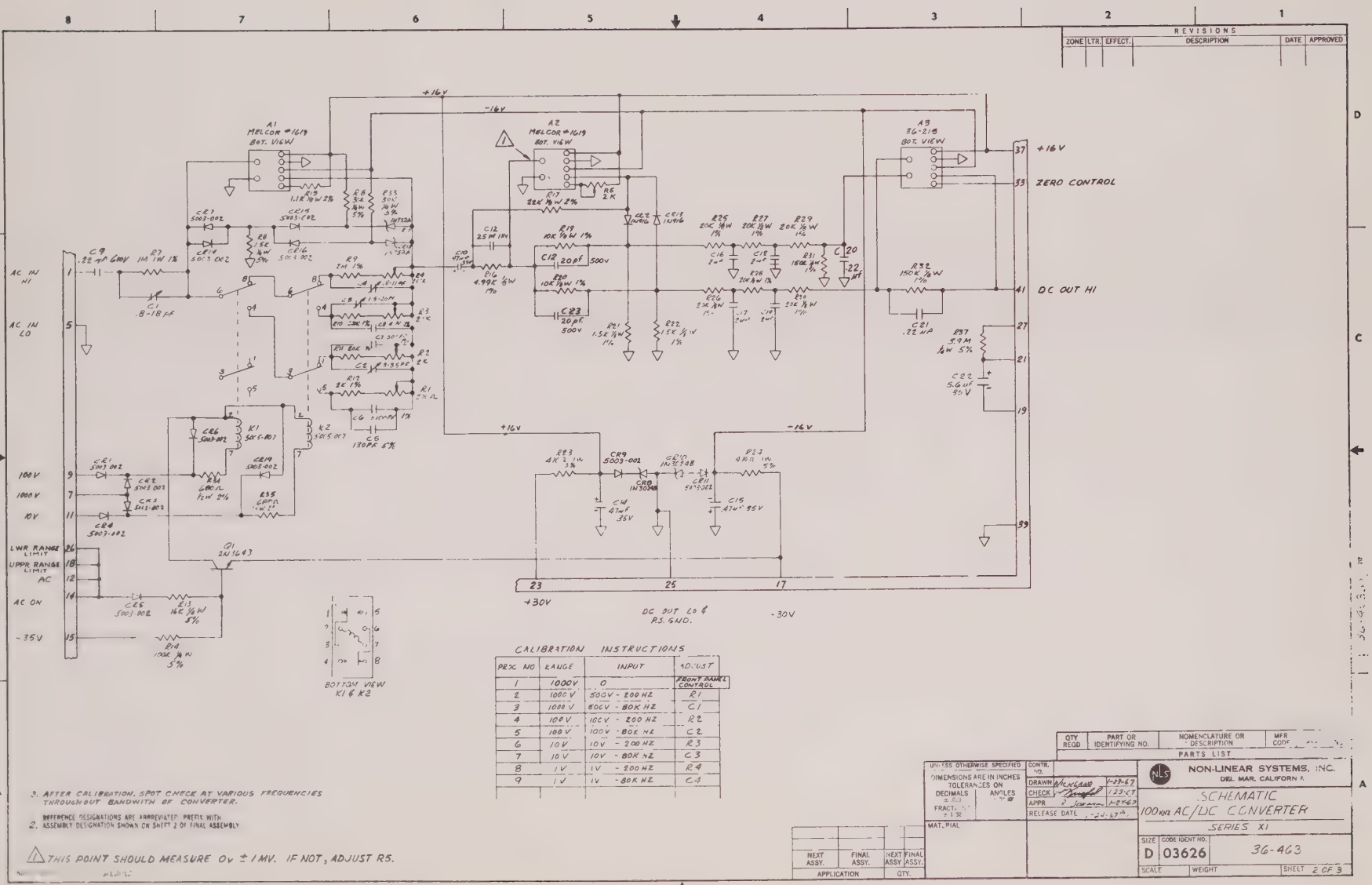
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

CONTR. NO
DRAWN Tom Edwards 11-23-66
CHECK [illegible] 1-11-67
APPR R. Hoffman 1-12-67
RELEASE DATE 1-16-67
MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC -
ACTIVE FILTER - HIGH SPEED
SERIES X-1

SIZE D | CODE IDENT NO 03626 | 36-428
SCALE | WEIGHT | SHEET 2 of 3



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

CALIBRATION INSTRUCTIONS

PROC NO	RANGE	INPUT	ADJUST
			FRONT PANEL CONTROL
1	1000V	0	
2	1000 V	500V - 200 HZ	R1
3	1000 V	500V - 80K HZ	C1
4	100 V	100V - 200 HZ	R2
5	100 V	100V - 80K HZ	C2
6	10 V	10V - 200 HZ	R3
7	10 V	10V - 80K HZ	C3
8	1 V	1V - 200 HZ	R4
9	1 V	1V - 80K HZ	C4

3. AFTER CALIBRATION, SPOT CHECK AT VARIOUS FREQUENCIES THROUGHOUT BANDWITH OF CONVERTER.

REFERENCE DESIGNATIONS ARE ARREVIATED PREFIX WITH
2. ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

⚠1 THIS POINT SHOULD MEASURE 0v ± 1 MV. IF NOT, ADJUST RS.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ANGLES FRACT.

MATERIAL

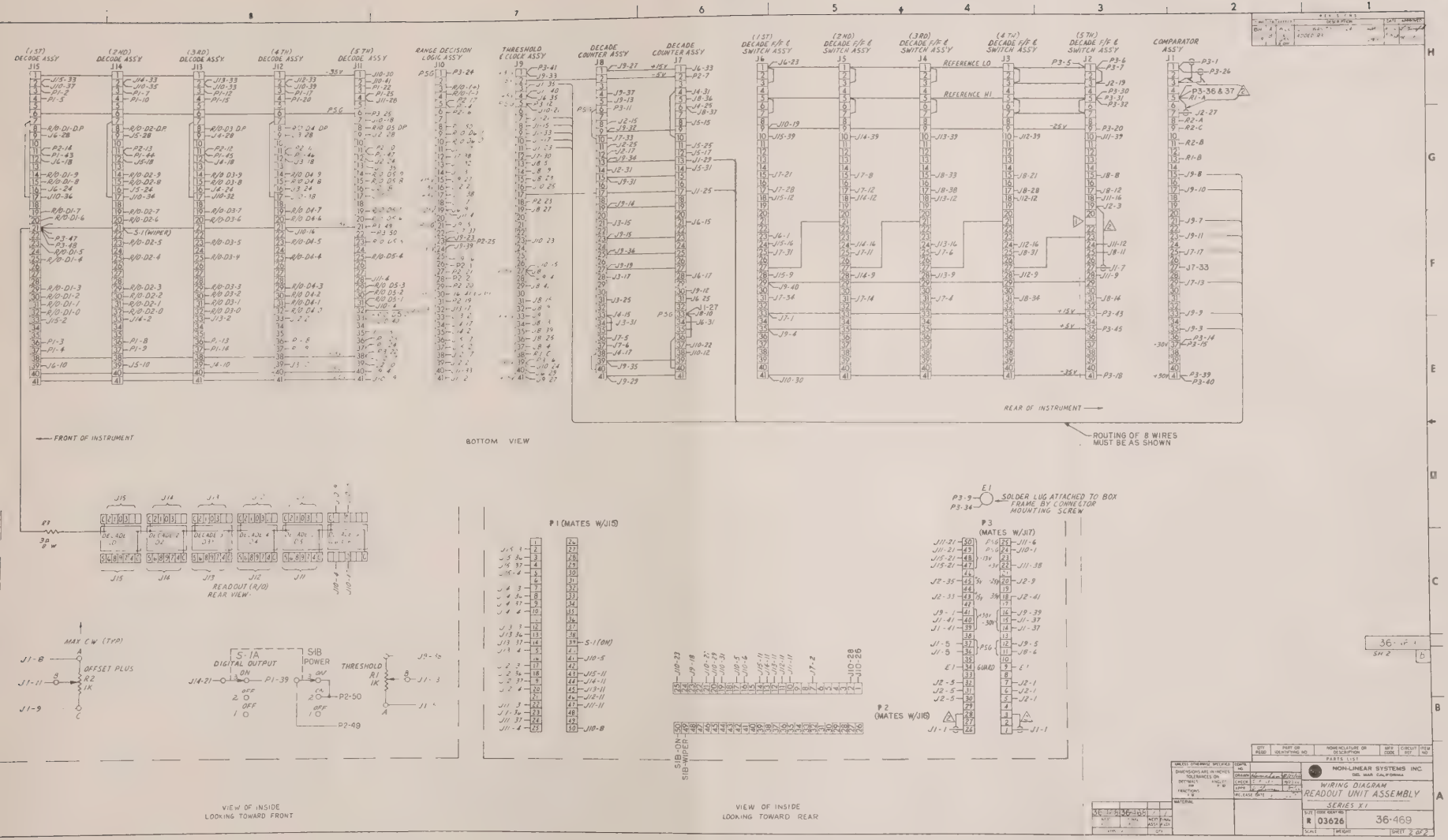
CONTR. NO.		
DRAWN	W. Williams	1-23-67
CHECK		1-23-67
APPR		1-24-67
RELEASE DATE	1-24-67	

NEXT ASSY. | FINAL ASSY. | NEXT ASSY. | FINAL ASSY.
APPLICATION | QTY.

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC
100 KHz AC/DC CONVERTER
SERIES X1

SIZE	CODE IDENT NO.	
D	03626	36-463
SCALE	WEIGHT	SHEET 2 OF 3



PARTS LIST

ITEM NO.	QUANTITY REQUIRED	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	REFR CODE	CIRCUIT ITEM NO.

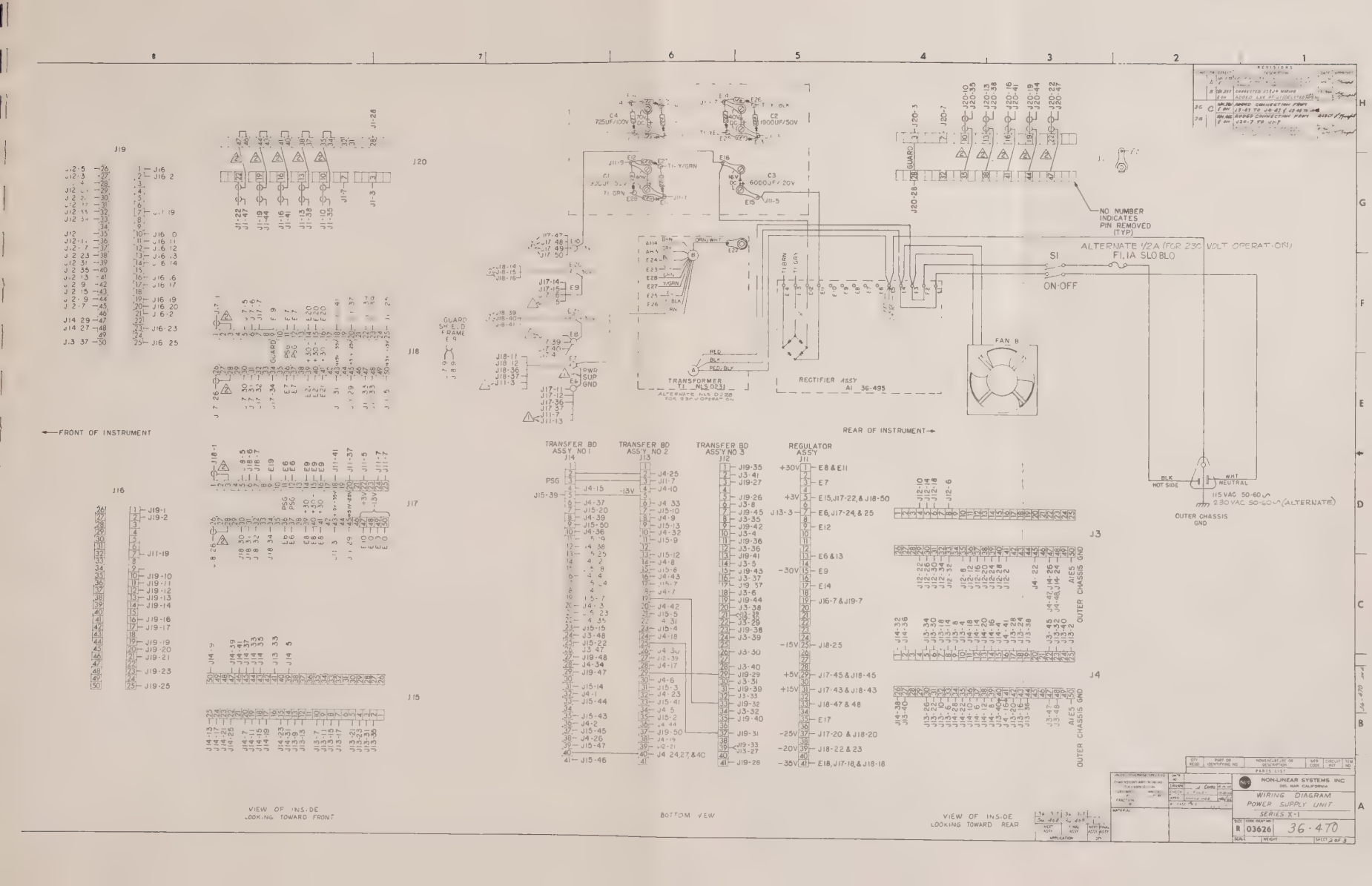
NON-LINEAR SYSTEMS INC.
DEL MAR, CALIFORNIA

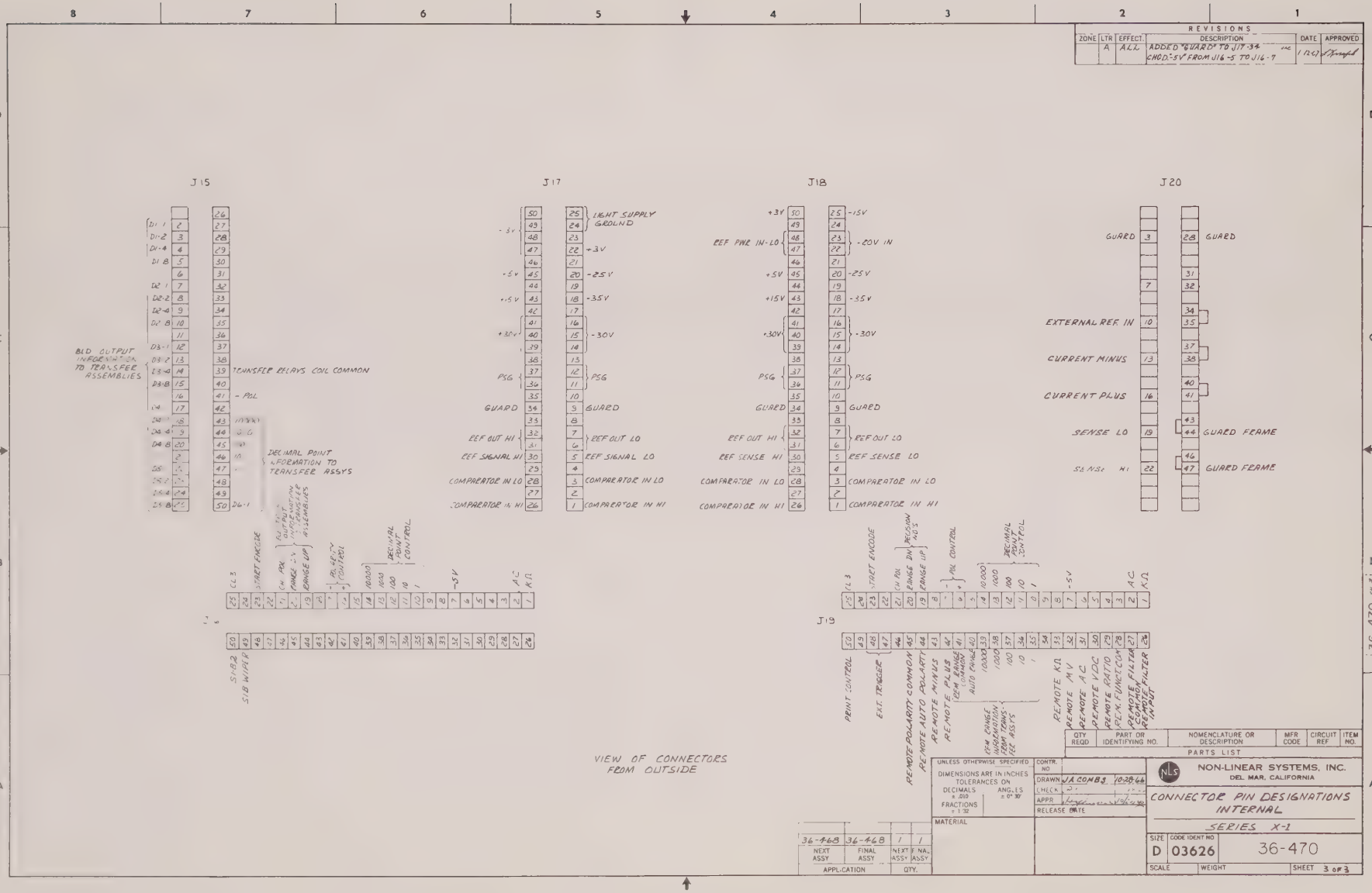
WIRING DIAGRAM
READOUT UNIT ASSEMBLY
SERIES XI

SIZE	CODE IDENT NO.	DRAWING NO.
B	03626	36-469

SCALE — WEIGHT — SHEET 2 OF 2

36-469 SH 2


FRONT OF INSTRUMENT
REAR OF INSTRUMENT
VIEW OF INSIDE LOOKING TOWARD FRONT
BOTTOM VIEW
VIEW OF INSIDE LOOKING TOWARD REAR
TRANSFORMER T1 NLS 0231
RECTIFIER ASSY A1 36-495
ALTERNATE 1/2A (FOR 230 VOLT OPERATION) F1, 1A SLO BLO
ON-OFF
NO NUMBER INDICATES PIN REMOVED (TYP)
FAN B
115 VAC 50-60 ~
230 VAC 50-60 ~ (ALTERNATE)
OUTER CHASSIS GND
HOT SIDE
NEUTRAL
TRANSFER BD ASSY NO 1 J14
TRANSFER BD ASSY NO 2 J13
TRANSFER BD ASSY NO 3 J12
REGULATOR ASSY J11
NON-LINEAR SYSTEMS INC
DEL MAR, CALIFORNIA
WIRING DIAGRAM
POWER SUPPLY UNIT
SERIES X-1
DWG NO R 03626
SIZE 36-470
SCALE
WEIGHT
SHEET 2 OF 3



REVISIONS					
ZONE	LTR	EFFECT.	DESCRIPTION	DATE	APPROVED
	A	ALL	ADDED "GUARD" TO J17-34 AND CHGD. -5V FROM J16-5 TO J16-7	1/24/67	

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO
DRAWN JA COMBS 10/28/66
CHECK
APPR
RELEASE DATE

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

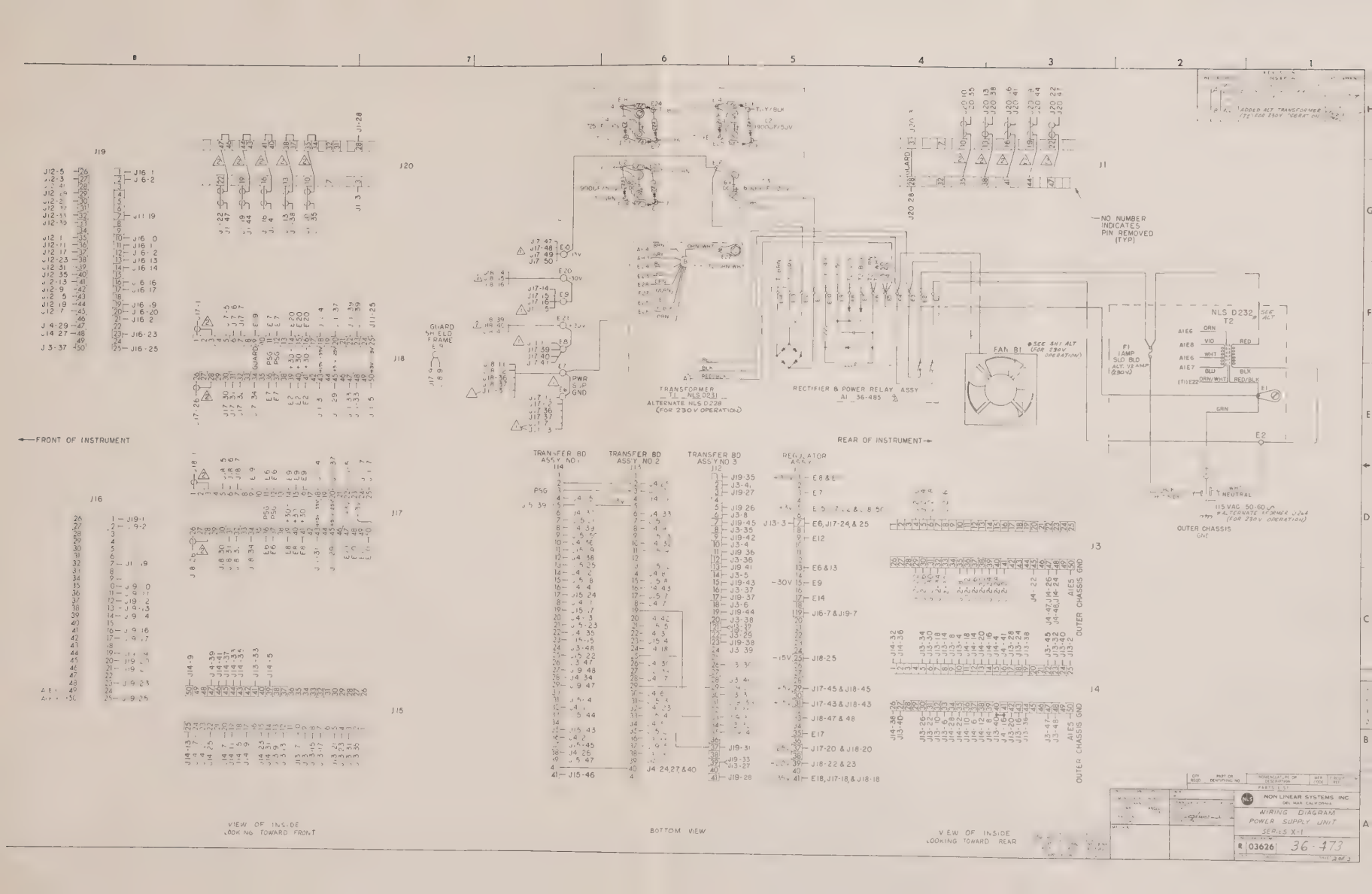
CONNECTOR PIN DESIGNATIONS INTERNAL

SERIES X-1

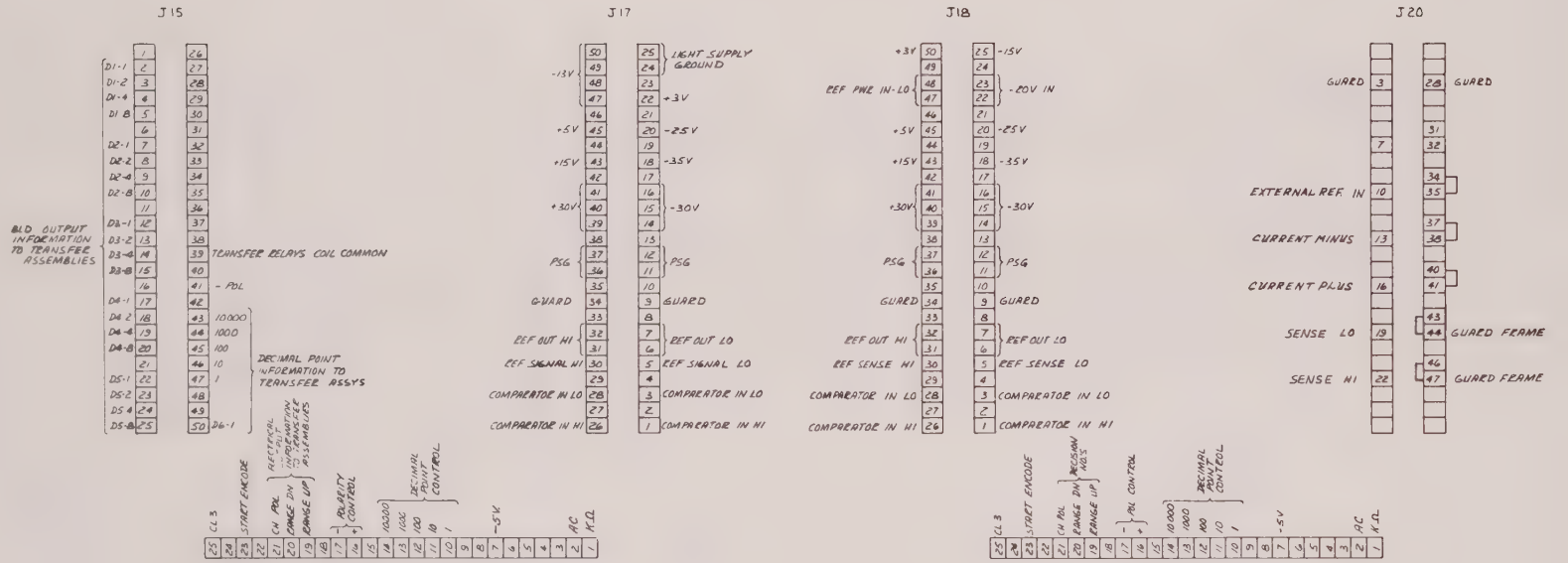
NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
36-468	36-468	1	1
APPLICATION		QTY.	

SIZE	CODE IDENT NO.	
D	03626	36-470
SCALE	WEIGHT	SHEET 3 OF 3

36-470 sh 3


NO NUMBER INDICATES PIN REMOVED (TYP)
TRANSFORMER T1 — NLS D231 ALTERNATE NLS D228 (FOR 230 V OPERATION)
RECTIFIER & POWER RELAY ASSY A1 36-485
FAN B1
NLS D232 SEE ALT T2
F1 1AMP SLO BLO ALT 1/2 AMP (230V)
115 VAC 50-60 V NEUTRAL
ALTERNATE XFORMER J264 (FOR 230 V OPERATION)
OUTER CHASSIS GND
FRONT OF INSTRUMENT
REAR OF INSTRUMENT
TRANSFER BD ASSY NO 1
TRANSFER BD ASSY NO 2
TRANSFER BD ASSY NO 3
REGULATOR ASSY
VIEW OF INSIDE LOOKING TOWARD FRONT
BOTTOM VIEW
VIEW OF INSIDE LOOKING TOWARD REAR
NON LINEAR SYSTEMS INC
WIRING DIAGRAM
POWER SUPPLY UNIT
SERIES X-1
03626
36-473

REVISIONS					
ZONE	LTR	EFFECT.	DESCRIPTION	DATE	APPROVED
	A	ALL	ADDED "GUARD" TO J17-34 AND CHGD "-6V" FROM J16-6 TO J16-7	1-17-67	



VIEW OF CONNECTORS FROM OUTSIDE

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO

PARTS LIST

36-472	36-472	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

CONTR. NO

DRAWN	Tom Deschaes	10-31-66
CHECK	D. FOLEY	10-31-66
APPR		11/1/66
RELEASE DATE		

MATERIAL

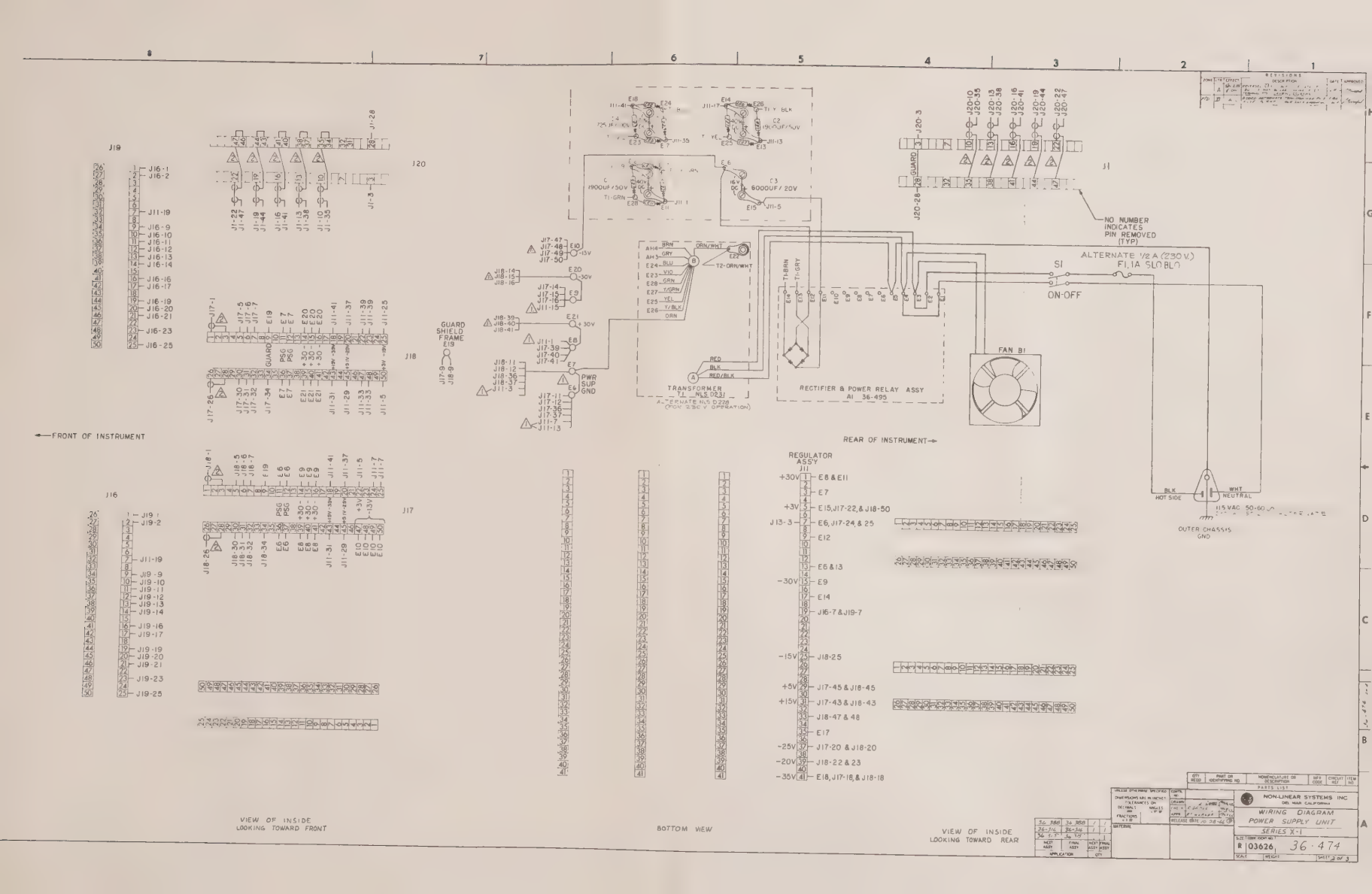
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

CONNECTOR PIN DESIGNATIONS INTERNAL

SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-473
SCALE	WEIGHT	SHEET 3 OF 3

36-473 SH 3


J19
J16-1
J16-2
J11-19
J16-9
J16-10
J16-11
J16-12
J16-13
J16-14
J16-16
J16-17
J16-18
J16-19
J16-20
J16-21
J16-23
J16-25
J20
J1-28
J1-22
J1-47
J1-19
J1-44
J1-16
J1-41
J1-13
J1-38
J1-10
J1-35
J1-3
J1-1
J18
J17-1
J17-5
J17-6
J17-7
J17-26
J17-30
J17-31
J17-32
J17-34
GUARD
PSG
+30
E19
E7
E20
E21
J11-41
J11-37
J11-39
J11-25
J11-31
J11-29
J11-33
J11-35
J11-5
+15V
FRONT OF INSTRUMENT
J16
J19-1
J19-2
J11-19
J19-9
J19-10
J19-11
J19-12
J19-13
J19-14
J19-16
J19-17
J19-19
J19-20
J19-21
J19-23
J19-25
J17
J18-1
J18-5
J18-6
J18-7
J18-26
J18-30
J18-32
J18-34
J11-41
J11-37
J11-5
J11-7
J11-31
J11-29
E10
E11
VIEW OF INSIDE
LOOKING TOWARD FRONT
GUARD
SHIELD
FRAME
E19
J17-9
J18-9
E18
J11-41
E24
C4
.22 MF 400V
J11-55
E7
E14
J11-17
E26
T1-Y BLK
C2
19000UF/50V
E25
J11-13
E13
T1-YEL
E23
C1
1900UF/50V
T1-GRN
E28
J11-1
E6
C3
6000UF/20V
E15
J11-5
J17-47
J17-48
J17-49
J17-50
E10
-15V
E20
-30V
J18-14
J18-15
J18-16
J17-14
J17-15
J17-16
J11-15
E9
E21
+30V
J18-39
J18-40
J18-41
J11-1
J17-38
J17-40
J17-41
E8
J18-11
J18-12
J18-36
J18-37
J11-3
E7
PWR
SUP
GND
E6
J17-11
J17-12
J17-36
J17-37
J17-7
J11-13
TRANSFORMER
T1 NLS 023J
ALTERNATE NLS D228
(FOR 230V OPERATION)
BRN
GRY
BLU
VIO
GRN
T/GRN
YEL
Y/BLK
ORN
AH4
AH3
E24
E23
E28
E27
E25
E26
ORN/WHT
E22
T2-ORN/WHT
RED
BLK
RED/BLK
T1-BRN
T1-GRY
E14
E15
E13
E12
E11
E10
E9
E8
E7
E6
E5
E4
E3
E2
E1
RECTIFIER & POWER RELAY ASSY
A1 36-495
FAN B1
REAR OF INSTRUMENT
J20-3
J20-10
J20-35
J20-13
J20-38
J20-16
J20-41
J20-19
J20-44
J20-22
J20-47
GUARD
J20-28
J1
NO NUMBER
INDICATES
PIN REMOVED
(TYP)
ALTERNATE 1/2 A (230 V.)
F1, 1A SLO BLO
SI
ON-OFF
BLK
HOT SIDE
WHT
NEUTRAL
115 VAC 50-60
OUTER CHASSIS
GND
REGULATOR
ASSY
J11
+30V
E8 & E11
E7
+3V
E15, J17-22, & J18-50
J13-3
E6, J17-24, & 25
E12
E6 & 13
-30V
E9
E14
J16-7 & J19-7
-15V
J18-25
+5V
J17-45 & J18-45
+15V
J17-43 & J18-43
J18-47 & 48
E17
-25V
J17-20 & J18-20
-20V
J18-22 & 23
-35V
E18, J17-18, & J18-18
BOTTOM VIEW
VIEW OF INSIDE
LOOKING TOWARD REAR
REVISIONS
DESCRIPTION
PARTS LIST
NON-LINEAR SYSTEMS INC
DEL MAR CALIFORNIA
WIRING DIAGRAM
POWER SUPPLY UNIT
SERIES X-1
R 03626
36-474
SCALE
WEIGHT
SHEET 2 OF 3

REVISIONS					
ZONE	LTR	EFFECT.	DESCRIPTION	DATE	APPROVE
	A	ALL	ADDED "GUARD" TO J17-34 ECO ADDED "AUX.1 POLARITY" TO J19-1 ADDED "AUX.2 POLARITY" TO J19-2 DELETED "EXT REF LO" FROM J20-7 CNGD. "-5V" FROM J16-8 TO J16-7	1/11/67	

J15

J17

J18

J20

J19

VIEW OF CONNECTORS FROM OUTSIDE

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO
		PARTS LIST			

36-388	36-388	/	/
36-316	36-316	/	/
36-315	36-315	/	/
NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 FRACTIONS ± 1/32 ANGLES ± 0° 30'

CONTR. NO

DRAWN J.A. COMBS 11-2-66

CHK'D 11-2-66

APPR

RELEASE DATE

MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

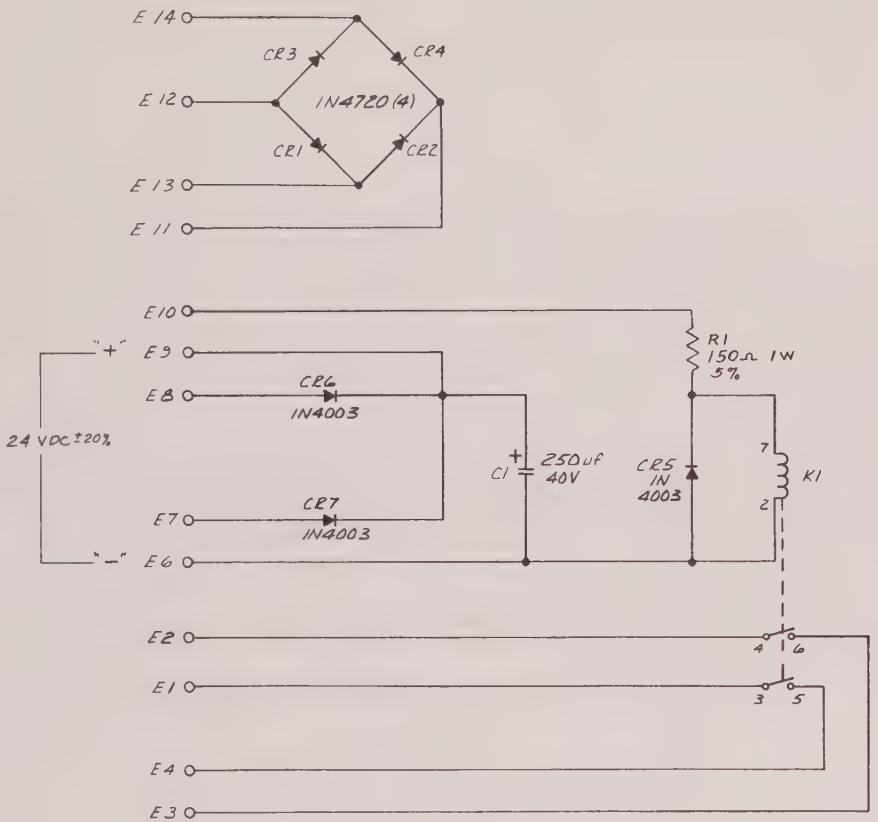
CONNECTOR PIN DESIGNATIONS INTERNAL

SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36 474
SCALE	WEIGHT	SHEET 3 OF 3

36-474 3

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED



E5 ◎ TIE PT. (OUTER CHASSIS GND)

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO.		
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN	TOM DEUCHARS	10-20-66
	CHECK	D FOLEY	10-21-66
	APPR	R. Warner	11-11-66
	RELEASE DATE	11 14-66 (D)	
MATERIAL			

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC -
RECTIFIER POWER

SERIES X-1

SIZE	CODE IDENT NO.	
C	03626	36-485

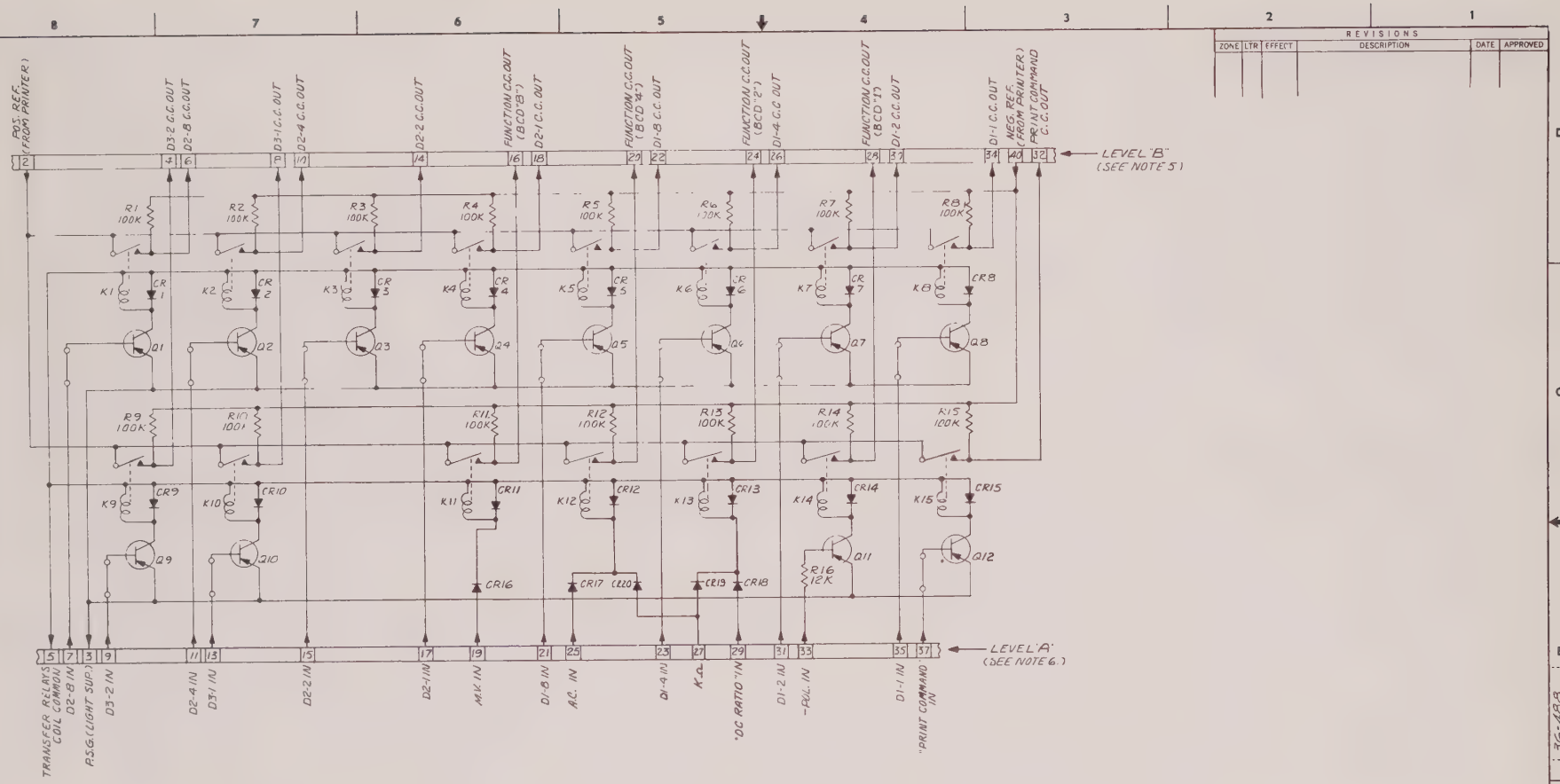
SCALE | WEIGHT | SHEET 2 OF 3

36-473	36-472	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
APPLICATION		QTY.	

DESIGNATIONS ARE ABBREVIATED: PREFIX WITH
NATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

NOTED [illegible] OTHERWISE SPECIFIED

36-485 SH 2



7. REFERENCE DESIGNATIONS ARE ABBREVIATED; PREFIX WITH ASSY. DESIG. SHOWN ON SH. 2 OF FINAL ASSY.
6. LEVEL 'A' MEANS PINS CONNECTED TO INSIDE WORLD" CIRCUITRY BY P.C. - ODD NUMBERED PINS NEAREST REAR OF METER.
5. LEVEL 'B' MEANS PINS CONNECTED TO 'OUTSIDE WORLD" CIRCUITRY USING HARDWIRE ON COMPONENT SIDE OF BOARD, EVEN NUMBERED PINS NEAREST FRONT OF METER.
4. ALL TRANSISTORS ARE 2N3644 / SK7431.
3. ALL RELAYS ARE NLS TYPE 5-12-27.
2. ALL DIODES ARE NLS TYPE 5003-002.
1. ALL RESISTORS ARE 1/4W, 5%.

NOTES: UNLESS OTHERWISE SPECIFIED.

REVISIONS					
ZONE	LTR	EFFECT	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO

PARTS LIST

NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY
36-472	36-472	1	1
36-468	36-468	1	1
APPLICATION		QTY	

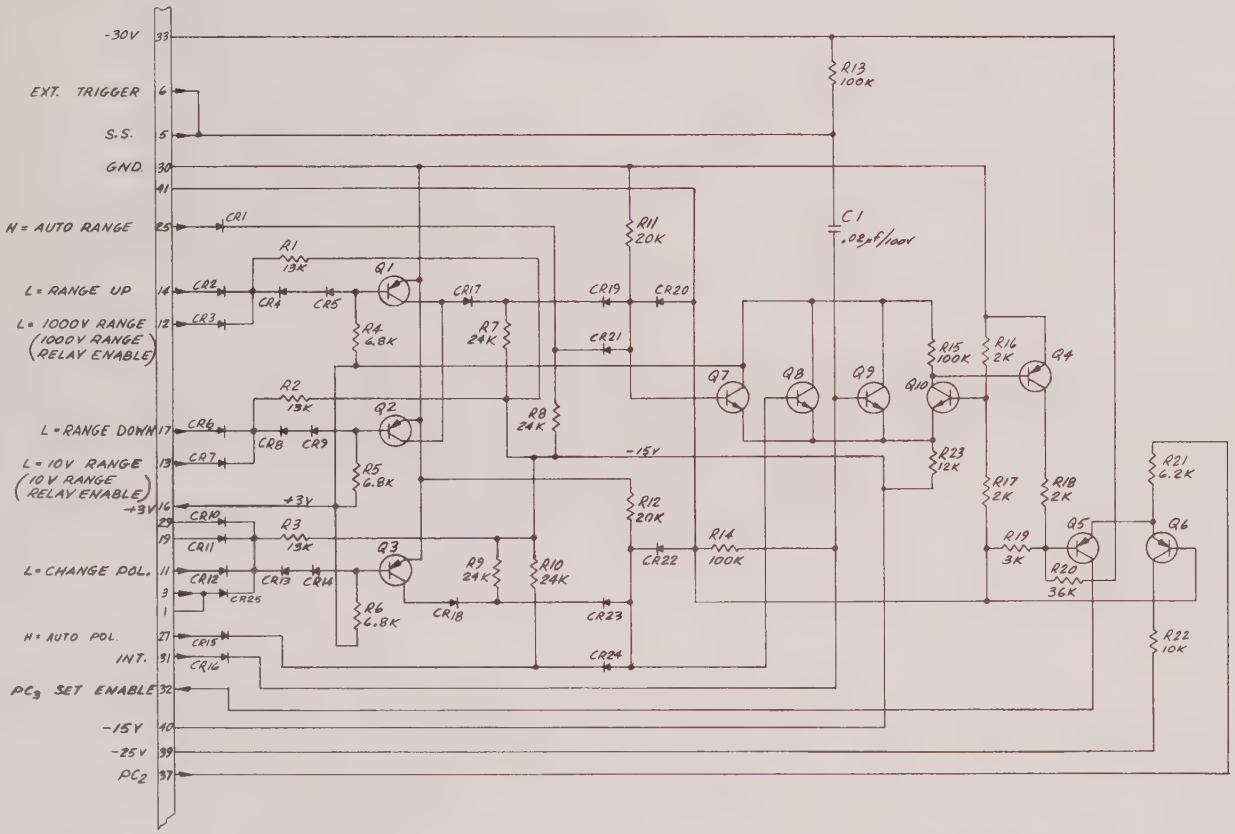
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL
CONTR. NO.
DRAWN Jon Deuchar 10 26 66
CHECK C. Foley 10 27 66
APPR W. Gilmore 11/3/66
RELEASE DATE

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC-
TRANSFER BD NO 2
SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-488
SCALE	WEIGHT	SHEET 2 of 2

36-488 SH. 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
B7	A	S/N 118 & ON	INCORPORATED E.O. 1 OF REV. 'B' R.A.W.	12-8-66	J. Mumford
	B	ALL	ADDED CONN. FROM PIN 1 TO 3, ADDED CONN. FROM PIN 41 TO ANODE OF CR20.	5-8-67 R.A.W.	R. Brooks

REFERENCE DESIGNATIONS ARE ABBREVIATED PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

4. NPN TRANSISTORS ARE 2N3904/2N3565/2N3711.
3. PNP TRANSISTORS ARE 2N3906/2N3638A/2N3702.
2. DIODES ARE NLS 5003-002
1. RESISTORS ARE 1/4 W., ±5%, CARBON.

NOTES: UNLESS OTHERWISE SPECIFIED

36-225	36-225	/	/
36-316	36-316	/	/
36-315	36-315	/	/
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
APPLICATION		QTY.	

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO.
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN P.V. KLAND 10-21-66
	CHECK J. Mumford 10-25-66
	APPR [illegible] 10-25-66
	RELEASE DATE 10-26-66
MATERIAL	

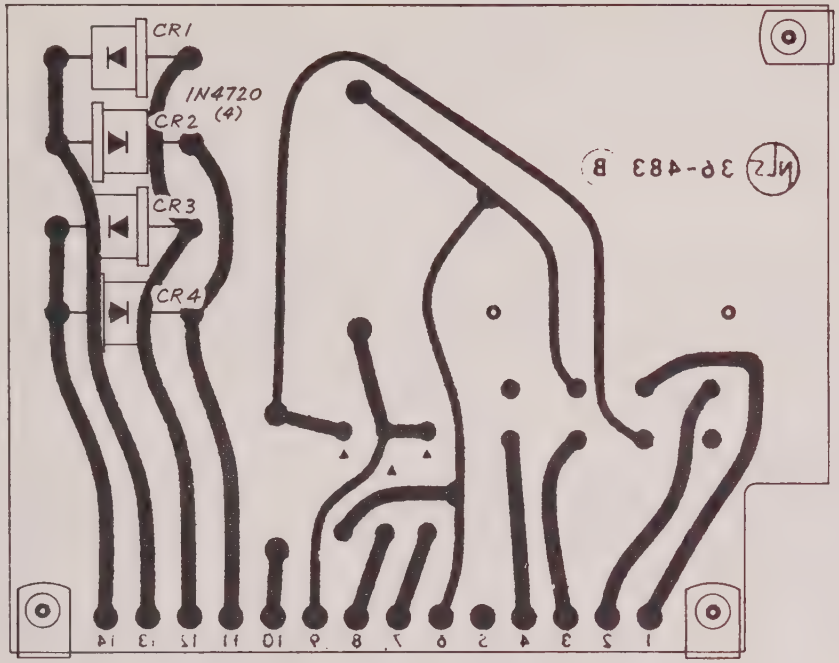
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

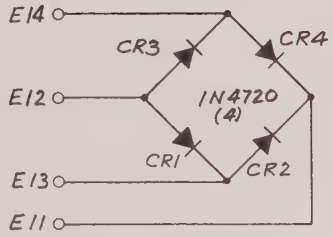
SCHEMATIC
SCAN CONTROL ASS'Y.
SERIES X-1 (REPLACES SCAN COUNTER ON 40 POINT METERS)

SIZE	CODE IDENT NO.	
D	03626	36-494
SCALE	WEIGHT	SHEET 2 OF 2

36-494

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED





QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.
4	IN 4720	DIODE	04713	CR1-4	2
1	36-484	PC BOARD, SUB-ASY			1

PARTS LIST

UNLESS OTHERWISE SPECIFIED	CONTR. NO.	
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 ANGLES ± 0° 30' FRACTIONS ± 1/32	DRAWN	11-11-66
	CHECK	11-14-66
	APPR	11-14-66
	RELEASE DATE	11-14-66
MATERIAL		

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

RECTIFIER ASSY-

SERIES X-1

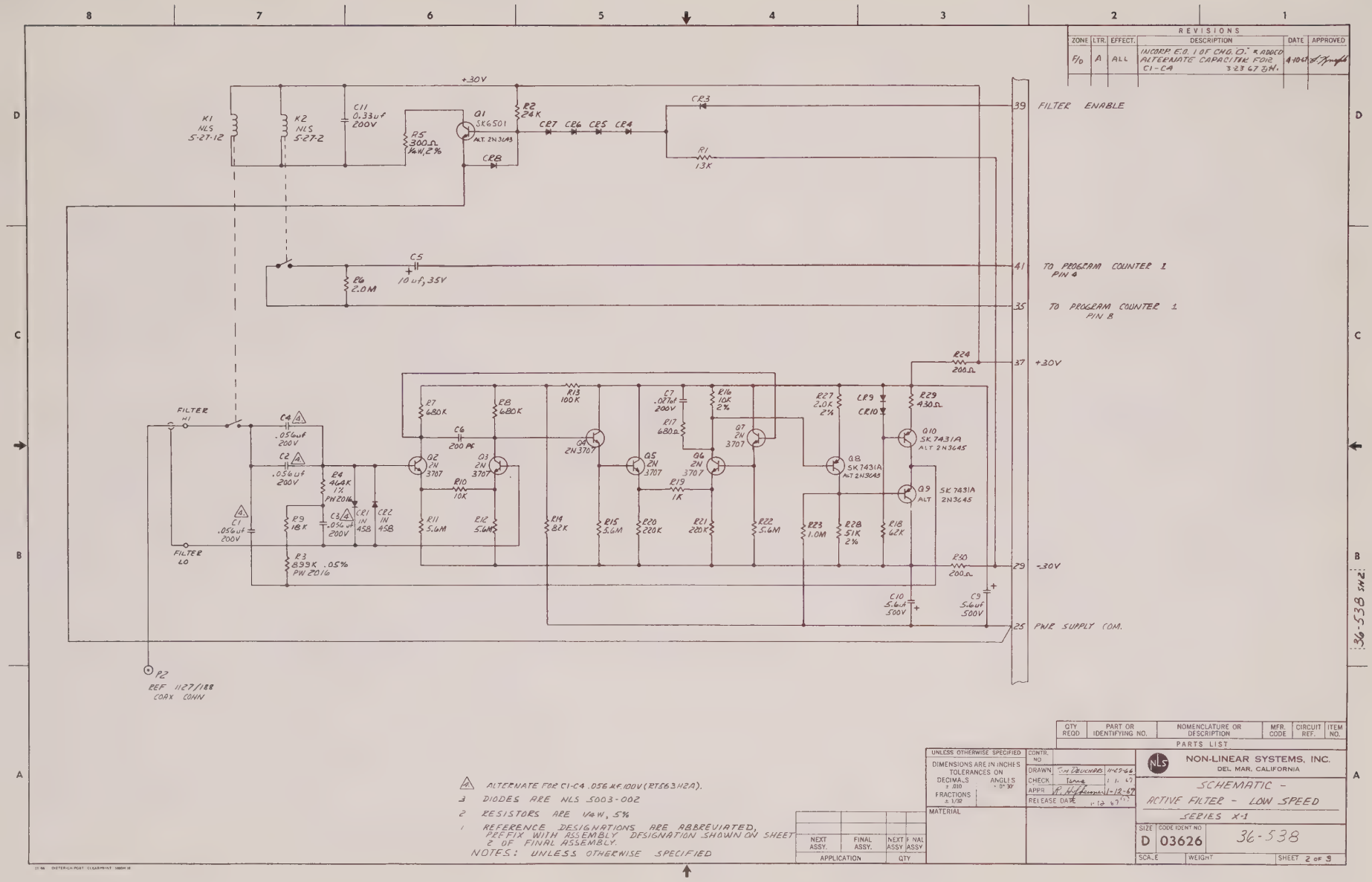
SIZE	CODE IDENT NO.	
C	03626	36-495

SCALE | WEIGHT | SHEET 1 OF 1

36-470	36-468	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
APPLICATION		QTY.	

REFERENCE DESIGNATIONS ARE ABBREVIATED; PREFIX WITH ... BLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY

36-495



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
F/0	A	ALL	INCORP E.O. 1 OF CHG. 'O'. R ADDED ALTERNATE CAPACITOR FOR C1-C4 3-23-67 ZM.	4-10-67	

QTY. REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

⚠4 ALTERNATE FOR C1-C4 .056 MF 100V (RT563H2A).
3 DIODES ARE NLS 5003-002
2 RESISTORS ARE 1/4W, 5%
1 REFERENCE DESIGNATIONS ARE ABBREVIATED, PREFIX WITH ASSEMBLY DESIGNATION SHOWN ON SHEET 2 OF FINAL ASSEMBLY.
NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'
MATERIAL
CONTR. NO
DRAWN Jim Edwards 4-25-66
CHECK Jerry 5-1-67
APPR R. Williamson 5-12-67
RELEASE DATE 5-12-67

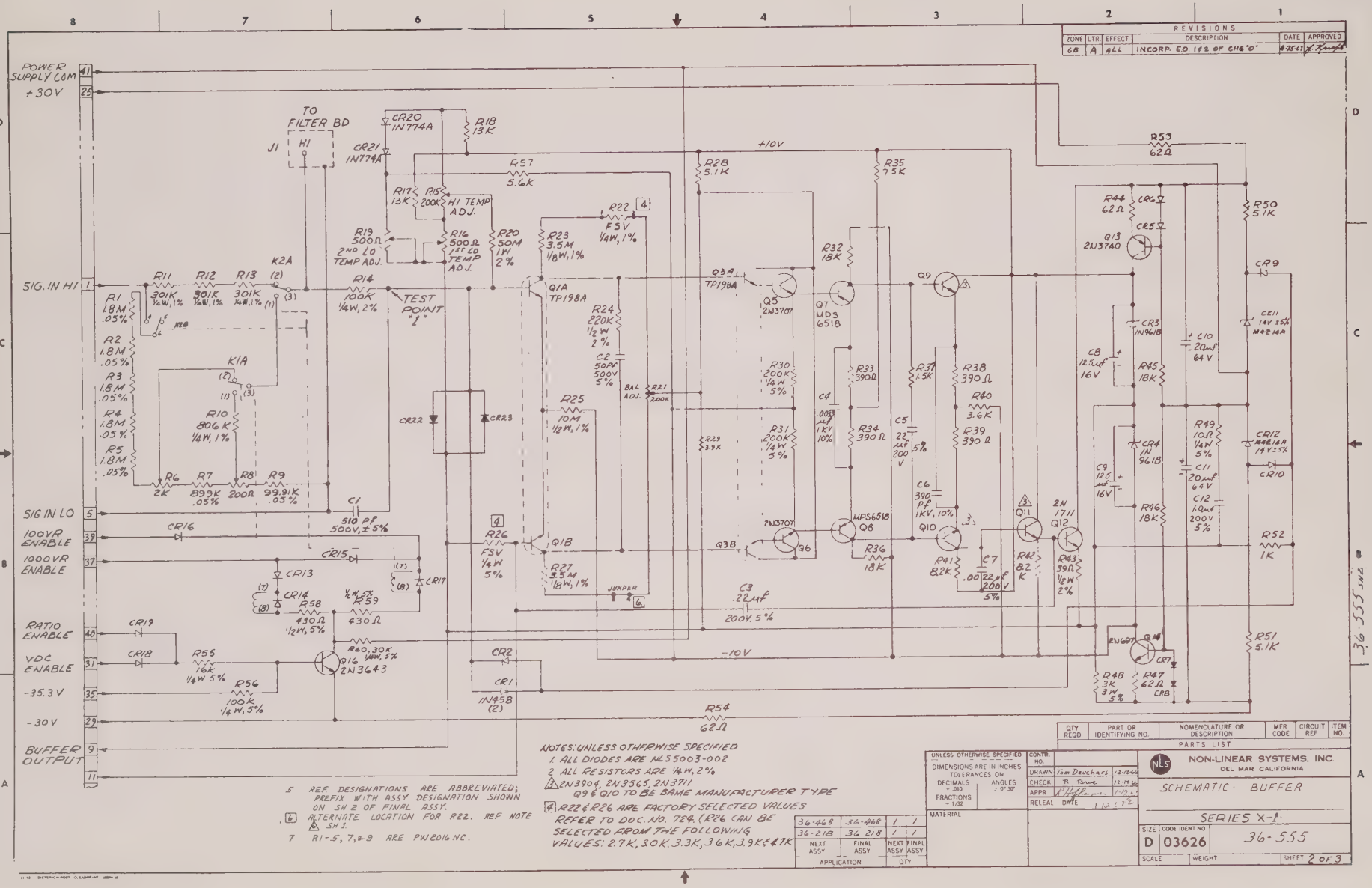
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC - ACTIVE FILTER - LOW SPEED
SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-538

SCALE | WEIGHT | SHEET 2 OF 9

36-538 SH 2



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL DIODES ARE NL55003-002
2. ALL RESISTORS ARE 1/4W, 2%
3. 2N3904, 2N3565, 2N3711 Q9 & Q10 TO BE SAME MANUFACTURER TYPE
4. R22 & R26 ARE FACTORY SELECTED VALUES REFER TO DOC. NO. 724. (R26 CAN BE SELECTED FROM THE FOLLOWING VALUES: 2.7K, 3.0K, 3.3K, 3.6K, 3.9K & 4.7K

5 REF. DESIGNATIONS ARE ABBREVIATED; PREFIX WITH ASSY DESIGNATION SHOWN ON SH 2 OF FINAL ASSY.
6 ALTERNATE LOCATION FOR R22. REF NOTE 4 SH 1.
7 R1-5, 7-9 ARE PW2016NC.

REVISIONS					
ZONE	LTR.	EFFECT	DESCRIPTION	DATE	APPROVED
6B	A	ALL	INCORP. E.O. 152 OF CHG "0"	4-25-67	

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

APPLICATION		QTY	
36-468	36-468	1	1
36-218	36-218	1	1
NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'
MATERIAL

CONTR. NO.		
DRAWN	Tom Deuchars	12-12-66
CHECK	R. Brue	12-19-66
APPR	[illegible]	1-10-67
RELEAS	DATE	1-12-67

NON-LINEAR SYSTEMS, INC.
DEL MAR CALIFORNIA

SCHEMATIC · BUFFER

SERIES X-1

SIZE	CODE IDENT NO	
D	03626	36-555
SCALE	WEIGHT	SHEET 2 OF 3

36-555 SH 2

THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF NON-LINEAR SYSTEMS INC., AND EXCEPT FOR RIGHTS EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, NON-LINEAR SYSTEMS INC. RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO.

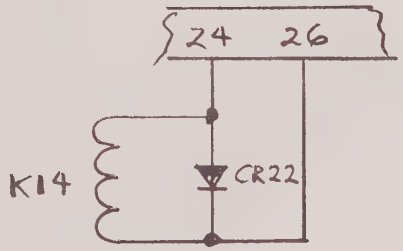
REVISIONS

SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
A		S/N .528 & ON	Inc E.O.I of Chg "O" ADDED CR22	11/9/67	R. Loh
B		ALL	Chg from 5-12-29 to 5-12-28	12/12/67	Knight

PART NO. 36-563 IS THE SAME AS PART NO. 36-179 EXCEPT RELAYS K1 THRU K13 AND K15

ARE REPLACED BY TYPE 5-12-28, (FORM B INSTEAD OF FORM A.)

AND FOR THE ADDITION OF CR22 AS SHOWN BELOW.



-	36-563	-	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 1-6-68

DRAWN L. Cooke 12/27/67
CHECK
APPR R Loh 12/27/67
MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

TRANSFER BOARD NO. 1

CODE IDENT NO.	SIZE	
03626	A	36-563
SCALE	WEIGHT	SHEET 1 OF 1

DIETERICH-POST CLEARPRINT 1000H

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REVISIONS

SYM	ZONE	EFFECT.	DESCRIPTION	DATE	APPROVED
A		ALL	Inc.e.o. 1 of chg "0" Chg from 5-12-29 to 5-12-28.	12-12-67	Forsyth

PART NO. 36-564 IS THE SAME AS PART NO. 36-467 EXCEPT RELAYS K1 THRU K14, K16 AND K17

ARE REPLACED BY TYPE 5-12-28. (FORM B INSTEAD OF FORM A.)

-	36-563	-	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
SURFACE ROUGHNESS PER MIL-STD-10 ✓
DO NOT SCALE THIS DRAWING
RELEASE DATE 1-6-67

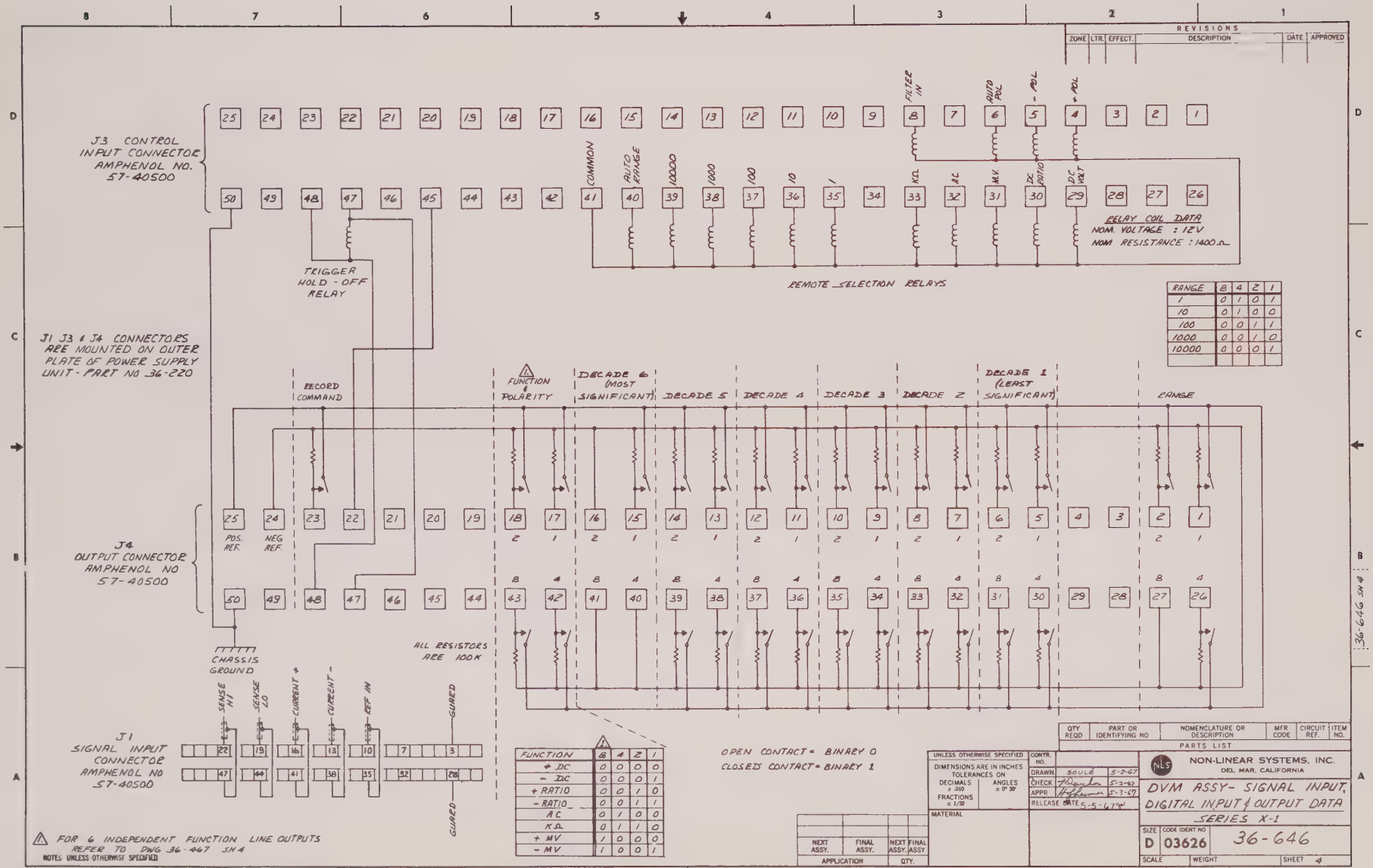
DRAWN P. Cooke 11/27/67
CHECK
APPR R. Lot 12/27/67
MATERIAL
FINISH

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

TRANSFER BOARD NO. 2

CODE IDENT NO.	SIZE	
03626	A	36-564
SCALE	WEIGHT	SHEET 1 OF 1

DIETERICH-POST CLEARPRINT 1000H


J3 CONTROL INPUT CONNECTOR AMPHENOL NO. 57-40500
J1 J3 & J4 CONNECTORS ARE MOUNTED ON OUTER PLATE OF POWER SUPPLY UNIT - PART NO 36-220
J4 OUTPUT CONNECTOR AMPHENOL NO 57-40500
J1 SIGNAL INPUT CONNECTOR AMPHENOL NO 57-40500
TRIGGER HOLD-OFF RELAY
REMOTE SELECTION RELAYS
COMMON
AUTO RANGE
10000
1000
100
10
1
FILTER IN
AUTO POL
- POL
+ POL
KΩ
AC
M.V.
DC RATIO
DC VOLT
RELAY COIL DATA
NOM. VOLTAGE : 12V
NOM RESISTANCE : 1400Ω
RANGE | B | 4 | 2 | 1
1 | 0 | 1 | 0 | 1
10 | 0 | 1 | 0 | 0
100 | 0 | 0 | 1 | 1
1000 | 0 | 0 | 1 | 0
10000 | 0 | 0 | 0 | 1
RECORD COMMAND
FUNCTION & POLARITY
DECADE 6 (MOST SIGNIFICANT)
DECADE 5
DECADE 4
DECADE 3
DECADE 2
DECADE 1 (LEAST SIGNIFICANT)
RANGE
POS. REF.
NEG. REF.
CHASSIS GROUND
ALL RESISTORS ARE 100K
SENSE HI
SENSE LO
CURRENT +
CURRENT -
REF IN
GUARD
GUARD
FUNCTION | B | 4 | 2 | 1
+ DC | 0 | 0 | 0 | 0
- DC | 0 | 0 | 0 | 1
+ RATIO | 0 | 0 | 1 | 0
- RATIO | 0 | 0 | 1 | 1
AC | 0 | 1 | 0 | 0
KΩ | 0 | 1 | 1 | 0
+ MV | 1 | 0 | 0 | 0
- MV | 1 | 0 | 0 | 1
OPEN CONTACT = BINARY 0
CLOSED CONTACT = BINARY 1
FOR 6 INDEPENDENT FUNCTION LINE OUTPUTS REFER TO DWG 36-467 SH 4
NOTES UNLESS OTHERWISE SPECIFIED

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

CONTR. NO.
DRAWN SOULE 5-2-67
CHECK 5-3-67
APPR 5-3-67
RELEASE DATE 5-5-67

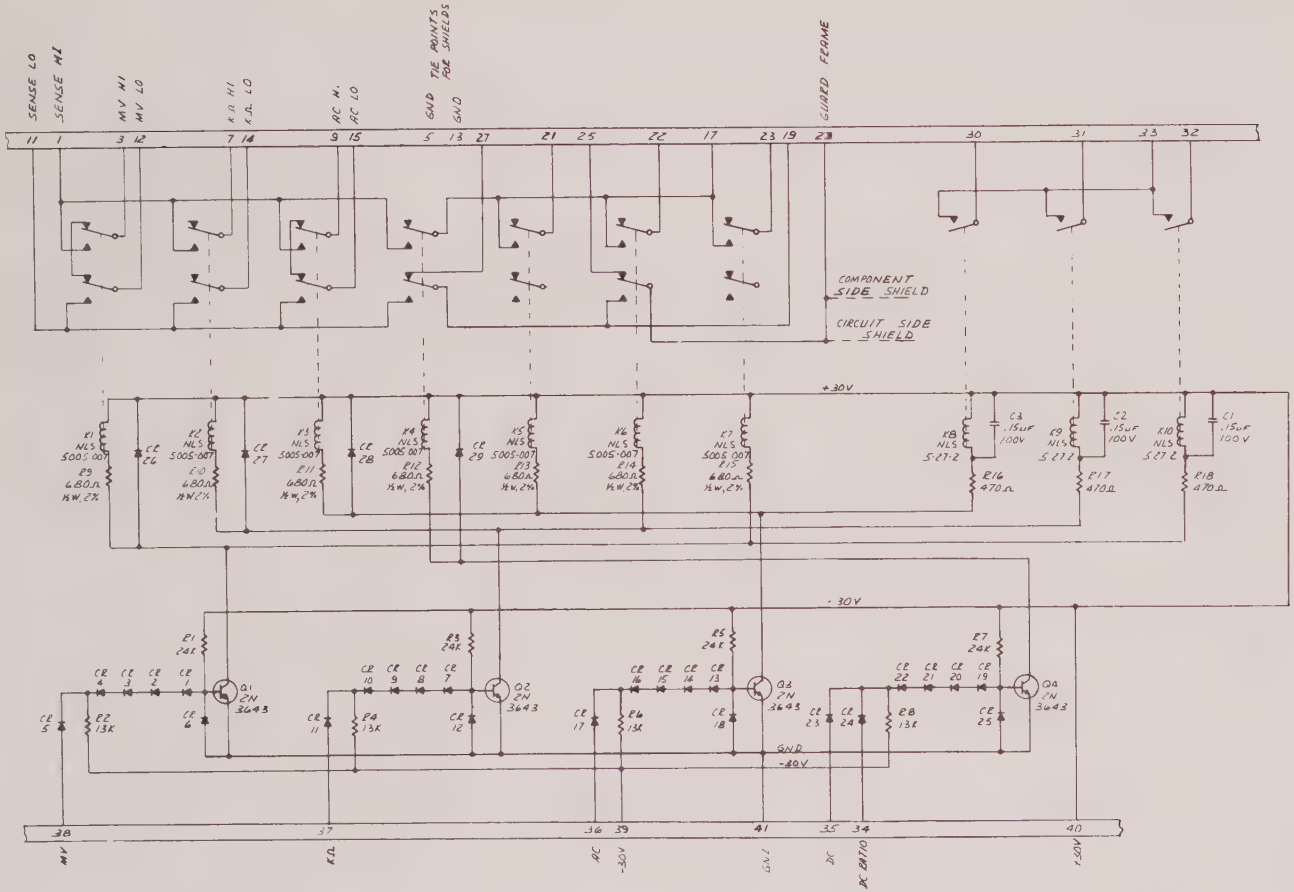
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

DVM ASSY- SIGNAL INPUT, DIGITAL INPUT & OUTPUT DATA
SERIES X-1

SIZE D | CODE IDENT NO 03626 | 36-646
SCALE | WEIGHT | SHEET 4

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY
APPLICATION		QTY.	

36-646 SH 4



REVISIONS					
ZONE	LTR.	EFFECT	DESCRIPTION	DATE	APPROVED
	A		ADDED BUS FROM K9 TO PIN 37	8-25-67	[illegible]
	B	ALL	PIN 37 WAS HI, PIN 38 WAS KΩ	10-17-67	[illegible]

2 ALL DIODES NLS 5003-002
1 ALL RESISTORS ¼W, 5%
NOTES: UNLESS OTHERWISE SPECIFIED

36-646	36-646	/	/
NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 | ANGLES ± 0° 30'
FRACTIONS ± 1/32

CONTR
DRAWN [illegible] 5-2-67
CHECK SOULE 5-3-67
APPR [illegible] 5-2-67
RELEASE DATE 5-5-67

MATERIAL

NON-LINEAR SYSTEMS, INC
DEL MAR CALIFORNIA

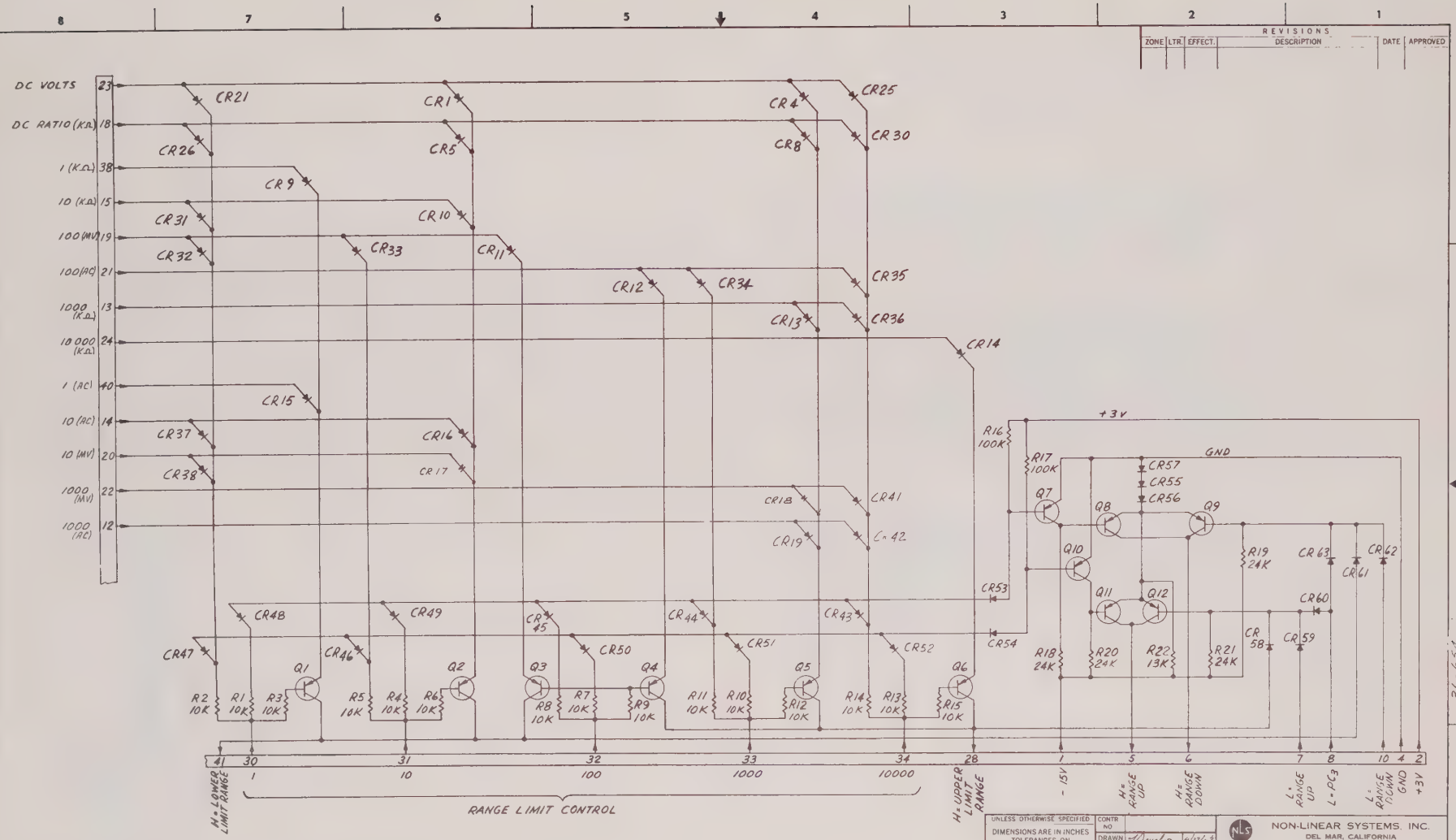
SCHEMATIC - FUNCTION SWITCHING

SERIES A

SIZE	CODE IDENT NO	
D	03626	36-651

SCALE | WEIGHT | SHEET 2

36-651 SHT 2



REVISIONS

ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

5. REF. DESIG. ARE ABBREV.; PREFIX WITH ASS'Y. DESIG. SHOWN ON SHEET 2 OF FINAL ASS'Y.
4. CIRCUIT REF. NOS NOT USED: CR 2, 3, 6, 7, 22, 23, 24, 27, 28, 20, 39, & 40.
3. PNP TRANSISTORS ARE 2N3906/3638A/2N3702.
2. RESISTORS ARE 1/4 W - CARBON - 5%
1. DIODES ARE NLS 5003-002.

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY
36-646	36-646	1	1
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32

MATERIAL

CONTR NO		
DRAWN	Mendoza	4/12/67
CHECK	Soule	4 20 67
APPR	Hoffman	5-2-67
RELEASE DATE	5-8-67	

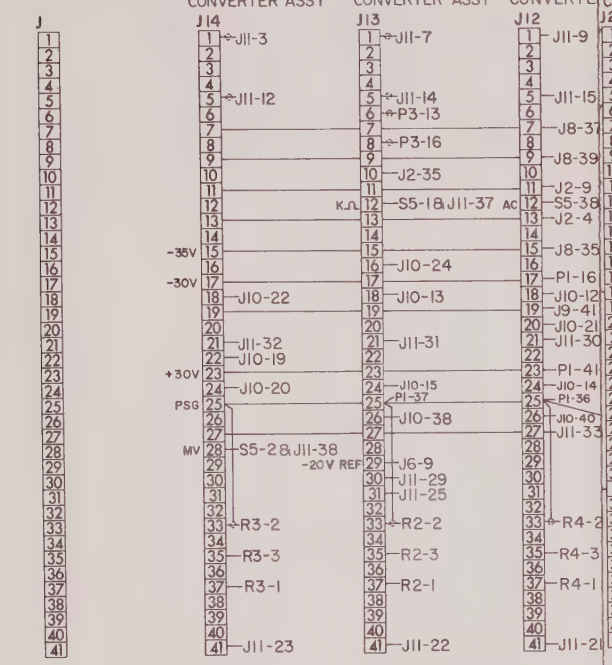
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

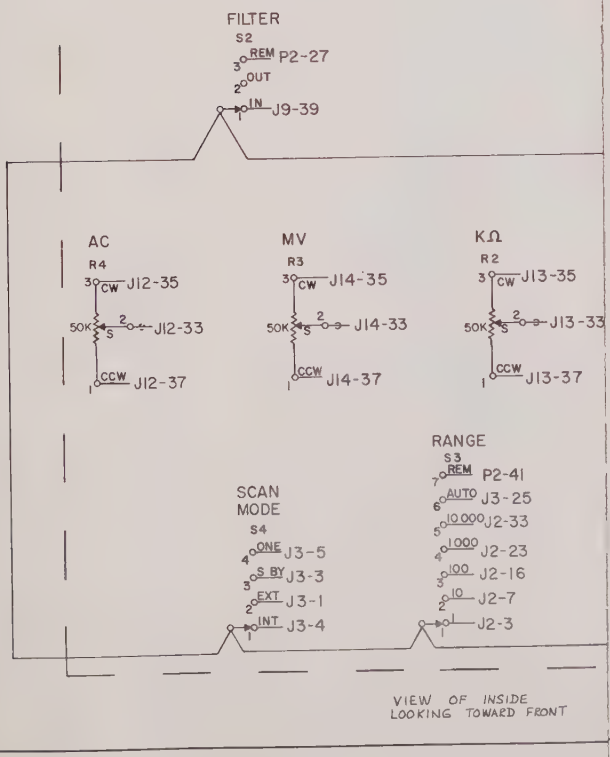
SCHEMATIC -
RANGE LIMIT LOGIC
SERIES X-1

SIZE	CODE IDENT NO.	
D	03626	36-654

SCALE | WEIGHT | SHEET 2

36-654 SH 2





REVISIONS					
ZONE	LTR	EFFECT.	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

CONTR. NO.
DRAWN Tom Dowler 6-28-67
CHECK SOULE 6-28-67
APPR W.P. Hewlett 7-3-67
RELEASE DATE 5-4-67

MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

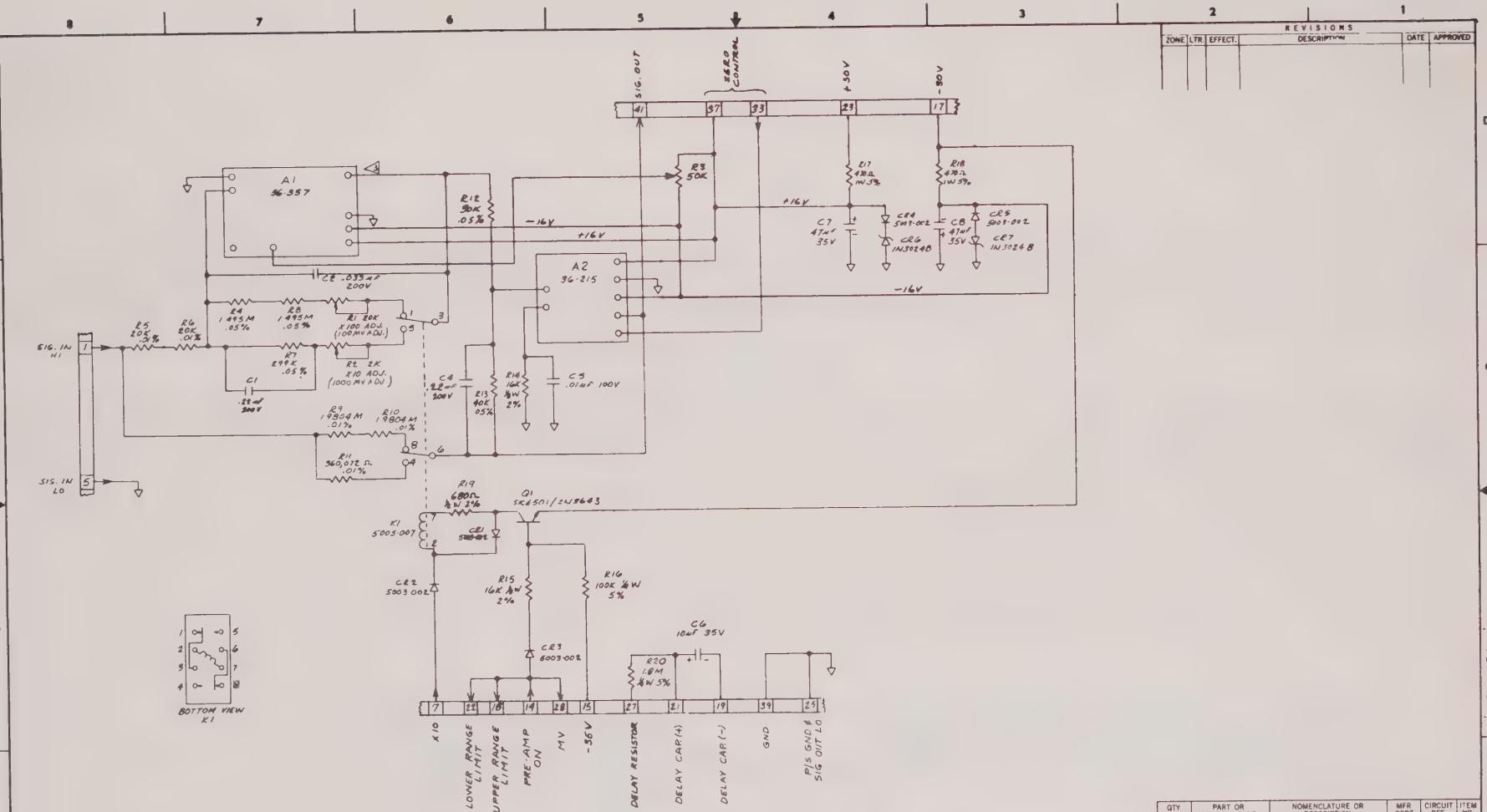
WIRING DIAGRAM
FUNCTION UNIT ASSEMBLY
SERIES X-1

SIZE E | CODE IDENT NO. 03626 | 36-655

SCALE | WEIGHT | SHEET 2 OF 2

36-646 NEXT ASSY	36-646 FINAL ASSY	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

36-655 SH 2



REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

△ WITH INPUT LEADS SHORTED TOGETHER, ADJUST R3 UNTIL THIS POINT MEASURES 0 VDC ± 500μV ON BOTH RANGES. ALLOW 15 MIN. WARM UP TIME.

1. R4 THRU R13 ARE NLS W.W.P. PW2016 RESISTORS.

NOTES:

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

CONTR NO
DRAWN Wheeler 4-26-67
CHECK [illegible] 5-3-67
APPR [illegible] 5-2-67
RELEASE DATE 5-5-67

MATERIAL: SEE SH-1

NEXT ASSY	FINAL ASSY	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

SCHEMATIC - MV CONVERTER ASSY

SERIES X1

SIZE	CODE IDENT NO	
D	03626	36-658
SCALE	WEIGHT	SHEET 2

36-658 rev

REVISIONS				
LTR	EFFECT.	DESCRIPTION	DATE	APPROVED

THIS ASSEMBLY SAME AS 36-655 ASSEMBLY EXCEPT FOR THE FOLLOWING WIRING CHANGES:

1. DELETE WIRE FROM J3-8 TO J5-16
2. ADD WIRE FROM J3-8 TO J5-33

36-759	36-759	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
ANGLES ± 0° 30'
FRACTIONS ± 1/32

MATERIAL

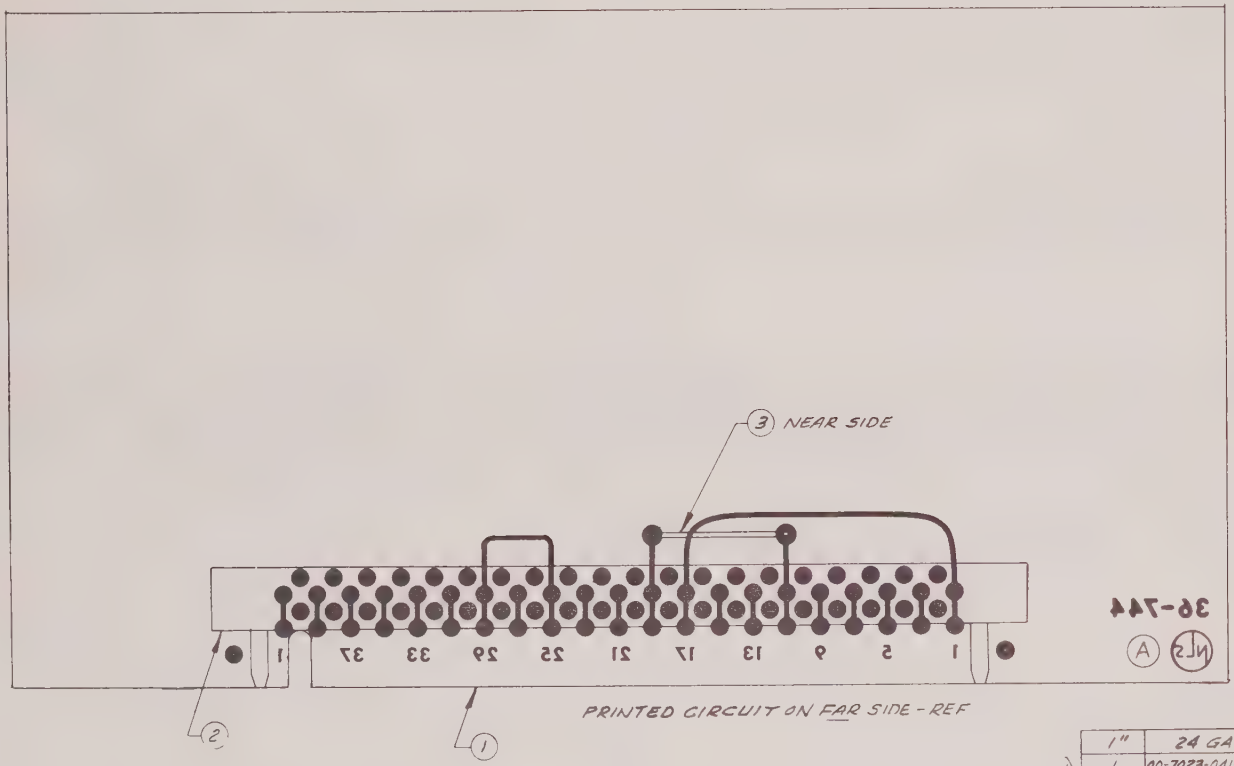
CONTR. NO.		
DRAWN	[illegible]	6-26-67
CHECK		
APPR	R. T. Warner	7-12-67
RELEASE DATE	8.22.67	

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

ASSEMBLY, FUNCTION UNIT

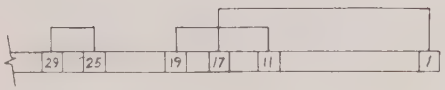
SIZE	CODE IDENT NO.	
A	03626	36-706
SCALE	WEIGHT	SHEET 1 CF 1

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
A-4 B-3	A	ALL	SCH & P.C. ADDED FROM P25 TO P29	6-13-67 WM	



QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.
1"	24 GA.	WIRE, BARE			3
1	00-7023-041-000-001	CONNECTOR	91662		2
1	36-745	P.C. S/A, JUMPER			1

PARTS LIST



SCHEMATIC

UNLESS OTHERWISE SPECIFIED	CONTR. NO.		
DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .010 FRACTIONS ± 1/32 ANGLES ± 0° 30'	DRAWN	SOULE	5-1-67
	CHECK	[signature]	5-1-67
	APPR	[signature]	5-2-67
	RELEASE DATE	5-5-67	
MATERIAL			

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

ASSEMBLY, JUMPER BOARD

SERIES X-1

SIZE	CODE IDENT NO.	
C	03626	36-746

SCALE 2-1 | WEIGHT | SHEET 1 OF 1

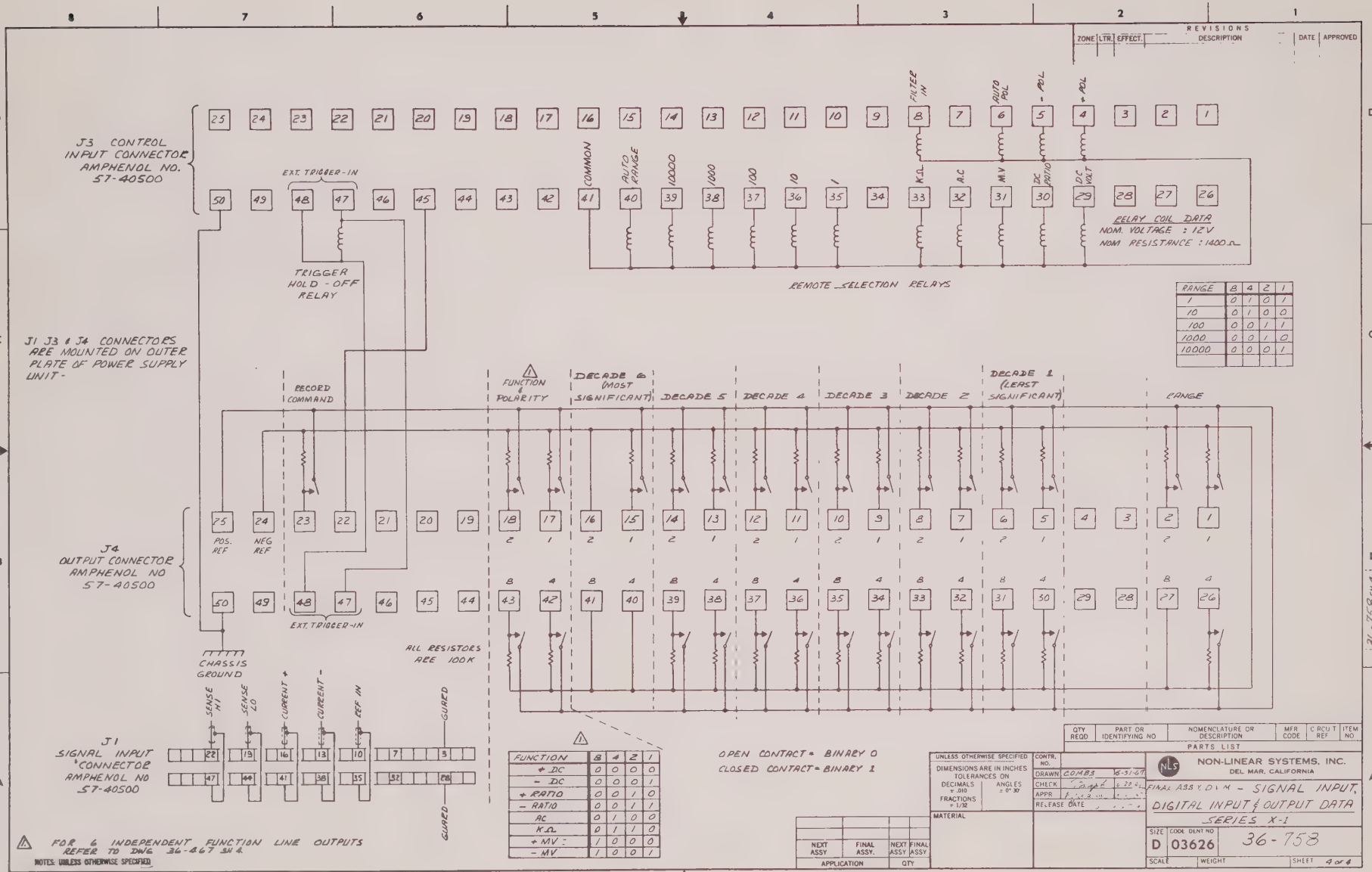
36-646	36-646	1	1
NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY.
APPLICATION		QTY.	

⚠1 ALTERNATE PART FOR ITEM 2:
4 EACH PART NO. 7001.1513 CONTACT
ELCO CORPORATION (91662)

NOTES: -

36-746

8/68 DIETER CH-POST CLEARPRINT 1000H-10



RANGE	8	4	2	1
1	0	1	0	1
10	0	1	0	0
100	0	0	1	1
1000	0	0	1	0
10000	0	0	0	1

FUNCTION	8	4	2	1
+ DC	0	0	0	0
- DC	0	0	0	1
+ RATIO	0	0	1	0
- RATIO	0	0	1	1
AC	0	1	0	0
KΩ	0	1	1	0
+ MV	1	0	0	0
- MV	1	0	0	1

REVISIONS

ZONE	LTR	EFFECT	DESCRIPTION	DATE	APPROVED

PARTS LIST

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MFR CODE	C RCU T REF	ITEM NO

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010
FRACTIONS ± 1/32
ANGLES ± 0° 30'

CONTR NO.
DRAWN COMBS 6-31-67
CHECK
APPR
RELEASE DATE
MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

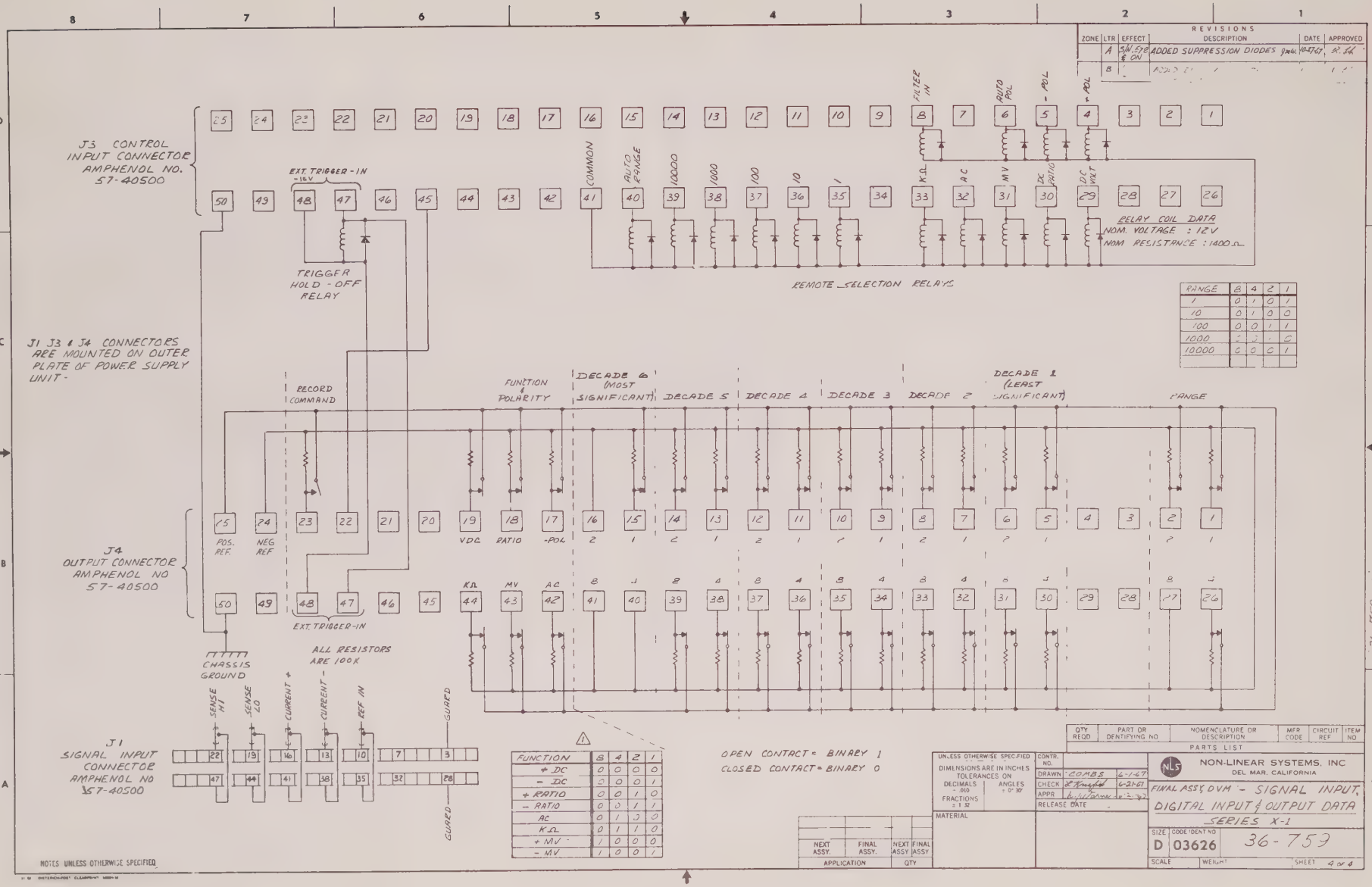
FINAL ASSY DWG - SIGNAL INPUT, DIGITAL INPUT & OUTPUT DATA SERIES X-1

SIZE D | CODE IDENT NO 03626 | 36-758

SCALE | WEIGHT | SHEET 4 of 4

NEXT ASSY	FINAL ASSY.	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

36-758 SH 4



RANGE	B	4	2	1
1	0	1	0	1
10	0	1	0	0
100	0	0	1	1
1000	0	0	1	0
10000	0	0	0	1

FUNCTION	B	4	2	1
+ DC	0	0	0	0
- DC	0	0	0	1
+ RATIO	0	0	1	0
- RATIO	0	0	1	1
AC	0	1	0	0
K Ω	0	1	1	0
+ MV	1	0	0	0
- MV	1	0	0	1

OPEN CONTACT = BINARY 1
CLOSED CONTACT = BINARY 0

NOTES UNLESS OTHERWISE SPECIFIED

ZONE	LTR	EFFECT	REVISIONS DESCRIPTION	DATE	APPROVED
	A	S/N 578 & ON	ADDED SUPPRESSION DIODES per 10-4747		R. H.
	B		ADDED C1		

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF.	ITEM NO.

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .010 ANGLES ± 0° 30' FRACTIONS ± 1/32

CONTR. NO.
DRAWN COMBS 6-1-67
CHECK 6-21-67
APPR
RELEASE DATE

MATERIAL

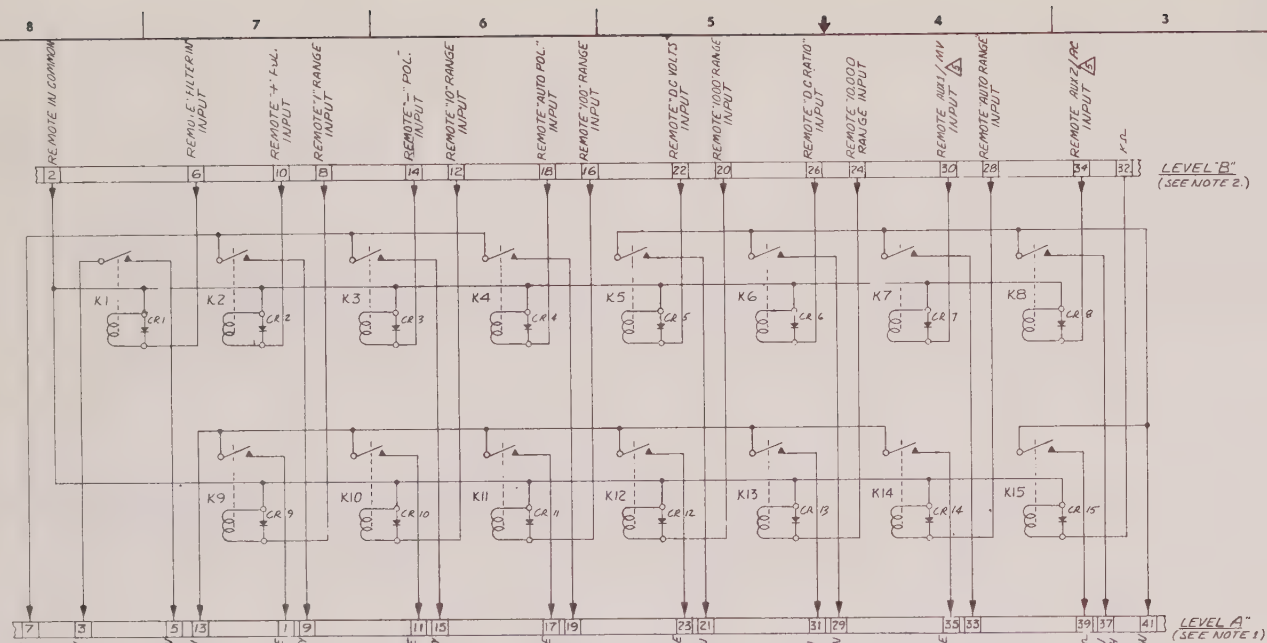
NEXT ASSY.	FINAL ASSY.	NEXT ASSY	FINAL ASSY
APPLICATION		QTY	

NON-LINEAR SYSTEMS, INC
DEL MAR, CALIFORNIA

FINAL ASS'Y DVM - SIGNAL INPUT, DIGITAL INPUT & OUTPUT DATA
SERIES X-1

SIZE	CODE IDENT NO	36-757
D	03626	
SCALE	WEIGHT	SHEET 4 of 4

36-757 rev A


REMOTE IN COMMON
REMOTE "FILTER IN" INPUT
REMOTE "+" POL. INPUT
REMOTE "1" RANGE INPUT
REMOTE "-" POL. INPUT
REMOTE "10" RANGE INPUT
REMOTE "AUTO POL." INPUT
REMOTE "100" RANGE INPUT
REMOTE "DC VOLTS" INPUT
REMOTE "1000 RANGE INPUT
REMOTE "DC RATIO" INPUT
REMOTE 10,000 RANGE INPUT
REMOTE AUX1 / MV INPUT
REMOTE AUTO RANGE INPUT
REMOTE AUX2 / PC INPUT
K1 K2 K3 K4 K5 K6 K7 K8
CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8
K9 K10 K11 K12 K13 K14 K15
CR9 CR10 CR11 CR12 CR13 CR14 CR15
LEVEL "B" (SEE NOTE 2.)
LEVEL "A" (SEE NOTE 1)
TO "REMOTE" POSITION POLARITY SWITCH
TO "REMOTE" POSITION FILTER SWITCH
TO "FILTER IN" POSITION FILTER SWITCH TO REMOTE POSITION RANGE SWITCH
TO "1" POSITION RANGE SWITCH TO + POSITION POLARITY SWITCH
TO "10" POSITION RANGE SWITCH TO - POSITION POLARITY SWITCH
TO "100" POSITION RANGE SWITCH TO "AUTO" POSITION POLARITY SWITCH
TO "1000" POSITION RANGE SWITCH TO D.C VOLTS POSITION FUNCTION SWITCH
TO "10,000" POSITION RANGE SWITCH TO "D.C RATIO" POSITION FUNCTION SWITCH
TO AUTO POSITION RANGE SWITCH TO AUX 1 / MV POSITION FUNCTION SWITCH
TO AUX 2 / PC POSITION FUNCTION SWITCH
TO "REMOTE" POSITION FUNCTION SWITCH

REVISIONS					
ZONE	LTR.	EFFECT	DESCRIPTION	DATE	APPROVED

4. REF. DESIG. ARE ABBREV.; PREFIX WITH ASSY. DESIG. SHOWN ON SH. 2 OF FINAL ASSY.
3. ALL RELAYS ARE NLS TYPE 5-12-27.
2. LEVEL "B" MEANS: PINS CONNECTED TO "OUTSIDE WORLD" CIRCUITRY USING HARDWIRE ON COMPONENT SIDE OF BOARD, EVEN NUMBERED PINS NEAREST FRONT OF METER.
1. LEVEL "A" MEANS: PINS CONNECTED TO "INSIDE WORLD CIRCUITRY BY P.C.-ODD NUMBERED PINS NEAREST REAR OF METER.

NOTES: UNLESS OTHERWISE SPECIFIED.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR CODE	CIRCUIT REF	ITEM NO.

PARTS LIST

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
36-759	36-759	1	1
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32
MATERIAL

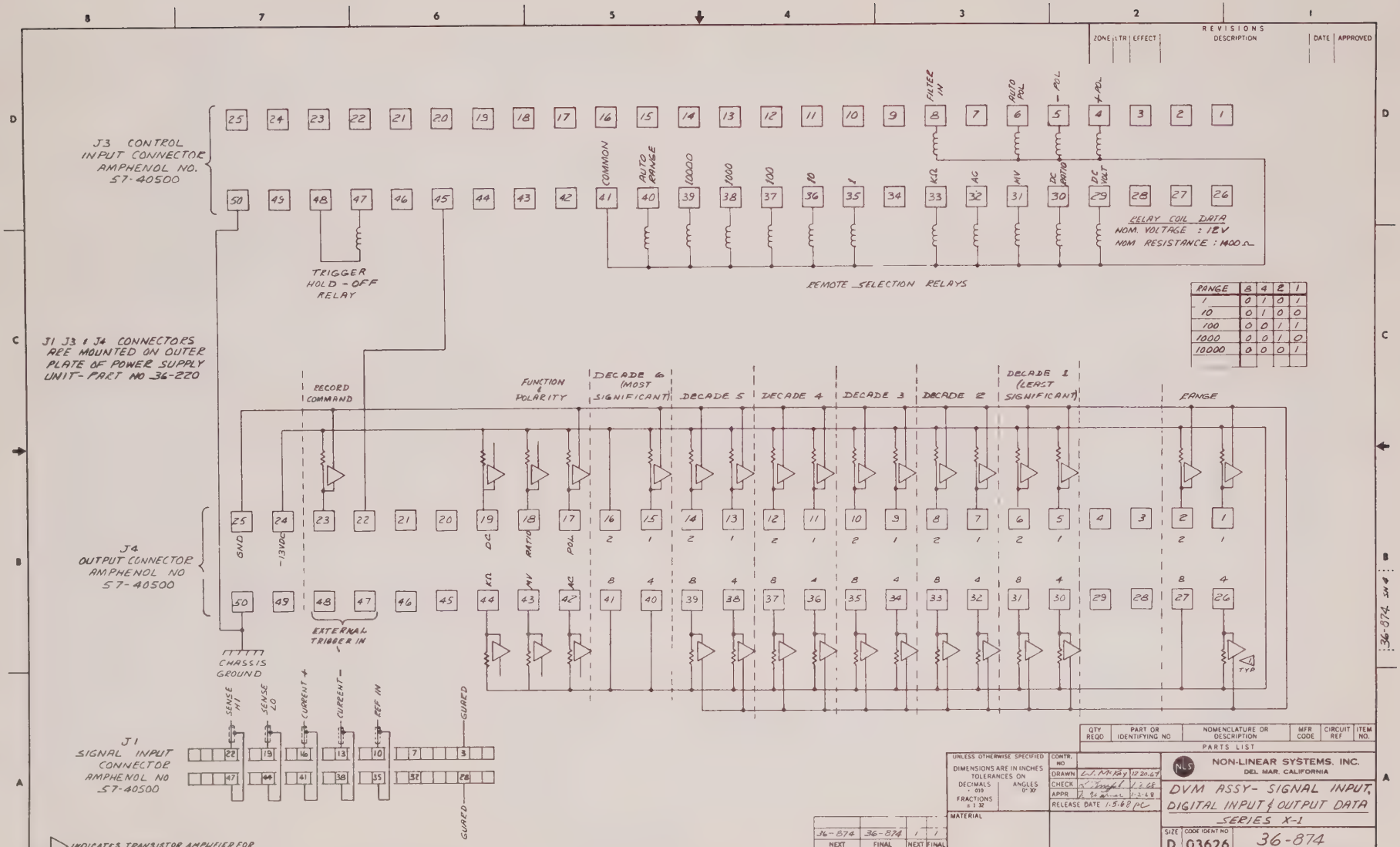
CONTR. NO.
DRAWN Wickland 10-27-67
CHECK
APPR
RELEASE DATE 11-2-67

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

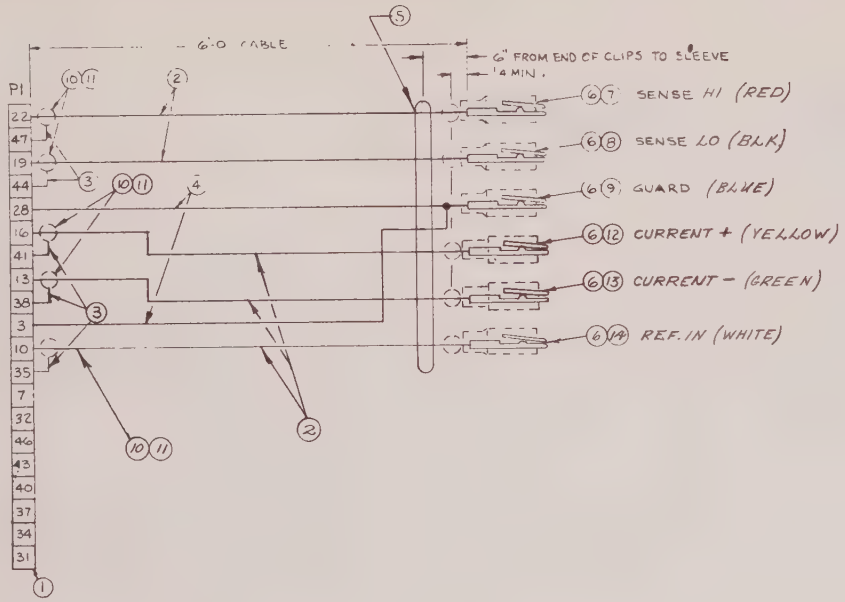
SCHEMATIC - (REMOTE INPUT) TRANSFER BOARD #3
SERIES X-1

SIZE	CODE IDENT NO.	36-836
D	03626	
SCALE —	WEIGHT —	SHEET 2 of 2

36-836 SHEET 2


REVISIONS
ZONE | LTR | EFFECT | DESCRIPTION | DATE | APPROVED
J3 CONTROL INPUT CONNECTOR AMPHENOL NO. 57-40500
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
COMMON
AUTO RANGE
10000
1000
100
10
1
FILTER IN
AUTO POL
- POL
+ POL
KΩ
AC
MV
DC RATIO
DC VOLT
TRIGGER HOLD-OFF RELAY
REMOTE SELECTION RELAYS
RELAY COIL DATA
NOM. VOLTAGE : 12V
NOM RESISTANCE : 1400Ω
RANGE | 8 | 4 | 2 | 1
1 | 0 | 1 | 0 | 1
10 | 0 | 1 | 0 | 0
100 | 0 | 0 | 1 | 1
1000 | 0 | 0 | 1 | 0
10000 | 0 | 0 | 0 | 1
J1 J3 & J4 CONNECTORS ARE MOUNTED ON OUTER PLATE OF POWER SUPPLY UNIT - PART NO 36-220
RECORD COMMAND
FUNCTION & POLARITY
DECADE 6 (MOST SIGNIFICANT)
DECADE 5
DECADE 4
DECADE 3
DECADE 2
DECADE 1 (LEAST SIGNIFICANT)
RANGE
J4 OUTPUT CONNECTOR AMPHENOL NO 57-40500
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
GND
-13VDC
DC
RATIO
POL
KΩ
MV
AC
8 4 2 1
EXTERNAL TRIGGER IN
CHASSIS GROUND
J1 SIGNAL INPUT CONNECTOR AMPHENOL 57-40500
SENSE HI
SENSE LO
CURRENT +
CURRENT -
REF IN
GUARD
22 19 16 13 10 7 3
47 44 41 38 35 32 28
TYP
INDICATES TRANSISTOR AMPLIFIER FOR BVL. OUTPUT. TRUE = 0 VDC ; FALSE = -13V DC
NOTES UNLESS OTHERWISE SPECIFIED
QTY REQD | PART OR IDENTIFYING NO | NOMENCLATURE OR DESCRIPTION | MFR CODE | CIRCUIT REF | ITEM NO.
PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .010 FRACTIONS ±1/32 ANGLES 0° 30'
CONTR NO
DRAWN L.J. McKay 12 20 67
CHECK
APPR
RELEASE DATE 1-5-68 PC
MATERIAL
NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA
DVM ASSY- SIGNAL INPUT, DIGITAL INPUT & OUTPUT DATA
SERIES X-1
SIZE D | CODE IDENT NO 03626 | 36-874
SCALE FULL | WEIGHT | SHEET 4 of 8
36-874 | 36-874 | 1 | 1
NEXT ASSY | FINAL ASSY | NEXT ASSY | FINAL ASSY
APPLICATION | QTY
36-874 SH 4

REVISIONS					
ZONE	LTR.	EFFECT.	DESCRIPTION	DATE	APPROVED
1B	A	ALL	ADDED INSERT PART NO. TO ITEM 1. ADDED WIRE LENGTH. WAS A/R	10-17-66 WAS	J Krupfle



NOTES:
1. STAMP PART NO. 15004-525 ON SLEEVING.
2. STAMP SYMBOL P1 ON SLEEVE AS REAR CONNECTOR
3. REMOVE ALL PINS NOT SHOWN ON P1

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MFR. CODE	CIRCUIT REF.	ITEM NO.
1	62-WHITE	INSULATOR, WHT. VINYL	95432		14
1	62-GREEN	INSULATOR, GRN. VINYL	95432		13
1	62-YELLOW	INSULATOR, YEL VINYL	95432		12
10	3/16 x 2 1/2	TUBING, SHRINK	THERMOFIT		11
5	323930	TERMASHIELD	89110		10
1	62 BLUE	INSULATOR, BLUE VINYL	95432		9
1	62 BLACK	" , BLACK VINYL	"		8
1	62-R.D	INSULATOR, RED VINYL	"		7
6	60-CS	CLIP, COPPER	95432		6
5'6"	VIOS	SLEEVING, VINYL 1/16 ID BLK.	05593		5
12"	# 20 AWG	WIRE STRANDED - BLK.			4
15"	# 22 AWG	WIRE, STRANDED - BLK.			3
30'	2G IMSA/U	COAX HI CABLE # 8269	70903		2
1	57-30506/ST-1222	CONNECTOR - 50 PIN WITH HI BARRIER INSERT	02660	P1	1

PARTS LIST

15004-525

NEXT ASSY.	FINAL ASSY.	NEXT ASSY.	FINAL ASSY.
36-218	36-218	1	1
APPLICATION		QTY.	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ± .010 ANGLES ± 0° 30'
FRACTIONS ± 1/32

CONTR. NO.		
DRAWN	J.A. COMBS	9-12-66
CHECK	D. FELT	9-27-66
APPR		
RELEASE DATE		

MATERIAL

NON-LINEAR SYSTEMS, INC.
DEL MAR, CALIFORNIA

CABLE - INPUT

USED ON SERIES X-1

SIZE	CODE IDENT NO.	
C	03626	15004-525

SCALE NONE | WEIGHT | SHEET 1 of 1

warranty

It is the continuous effort of Non-Linear Systems, Inc., to design and manufacture its products in such fashion as to at all times achieve the maximum customer satisfaction. Non-Linear Systems, Inc., issues this warranty in full recognition of its continuing obligation to its customers and its desire to always retain their respect and good will.

Non-Linear Systems, Inc., shall correct, either by repair or replacement, defects in material or workmanship in Non-Linear manufactured units or components where such defect develops within one year after delivery of the equipment to the original customer. In the instance of a defect of Sub-assemblies, Assemblies or Instruments manufactured by others than Non-Linear, every effort will be made to assist the customer in obtaining relief from the original manufacturer.

Any instrument claimed to be defective must be returned to Non-Linear Systems, Inc., Del Mar, California, transportation charges prepaid. The instrument will be repaired and returned to the purchaser, transportation prepaid, unless the instrument is found to be damaged by misuse, in which case the instrument will be returned to the purchaser with repair and transportation billed.

This warranty, being the entire agreement between the parties, is given expressly and in place of all other express or implied warranties including implied warranties for merchantability or fitness for particular use.

Non-Linear Systems, Inc.

ODBITKA

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